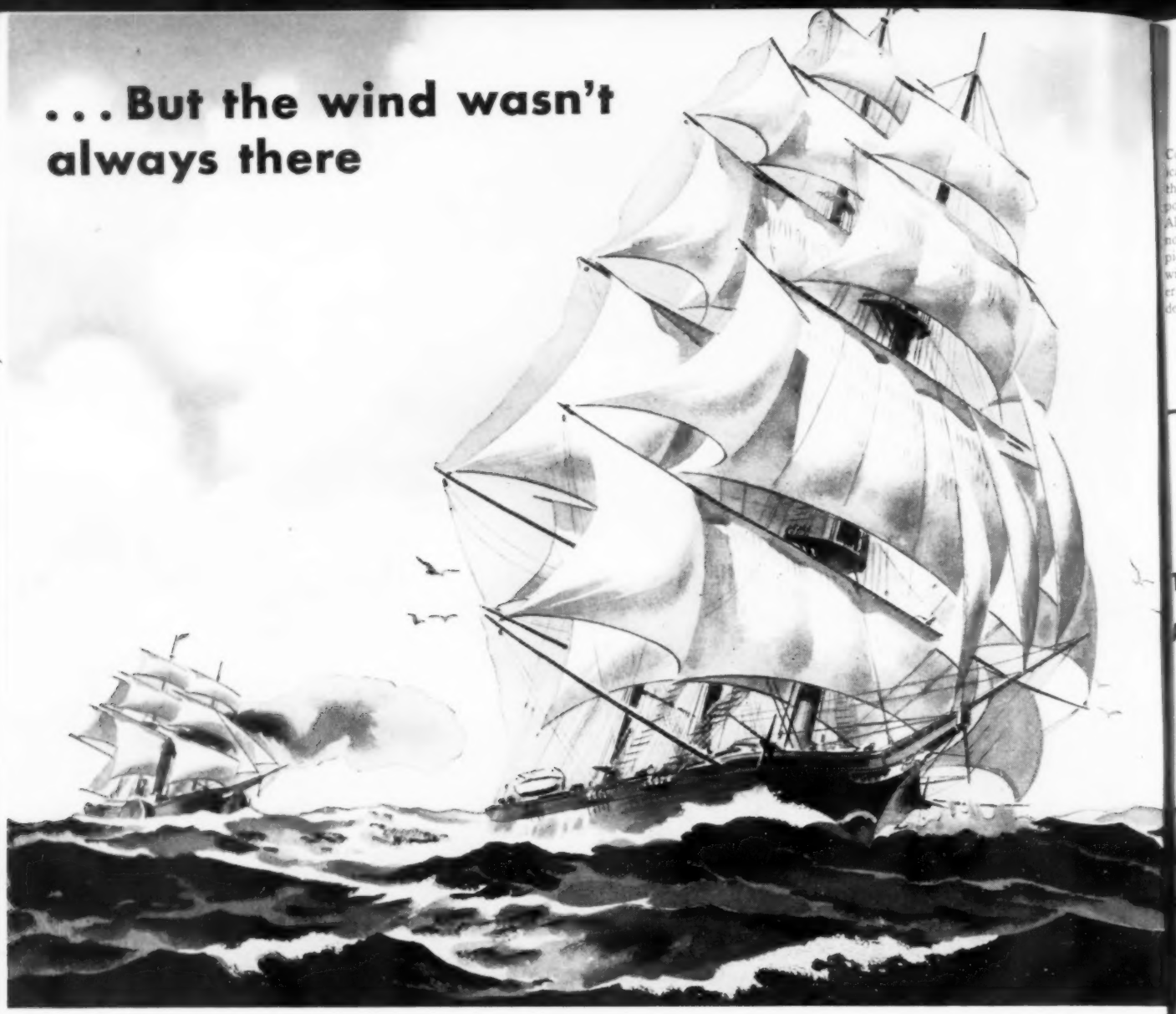
The Tool Engineer

APRIL 1954

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

. . . But the wind wasn't always there



IN THE Clipper ship era of the 1840's 20 knots with a favoring wind was considered good time — as indeed it would be today. But the wind wasn't always there. In the long run steam won out in the competitive race.

We say, "That's progress" but it's really competition which makes the difference between historic failures and continuing success. In the case of the Clippers something better, more dependable came along — and it will always be that way.

Like everyone else in today's highly competitive market you're certainly looking for new ways to improve product quality and cut manufacturing cost. Very possibly we here at Heald can help. Heald automatic sizing, constant feed throttling, centerless grinding, faster cycles, versatility, transfer type Bore-Matics, battery type equipment and a host of other unique Heald features for faster, better precision finishing are available for a wide variety of jobs. We would welcome the opportunity to show you how a fresh Heald viewpoint can help — on long or short runs, single or multi-purpose setups.

Competition is wonderful when you're *ahead* of it. Our business is to keep you there. That's why IT PAYS TO COME TO HEALD.

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Cover: ...roads of America ... Philadelphia during the ... Industrial Exposition and Convention. Although tool engineers do not look like the men depicted by artist Solms, they will put their heads together there to study the latest developments in production.

The Tool Engineer

Volume XXXII, No. 4 April, 1954

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THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*

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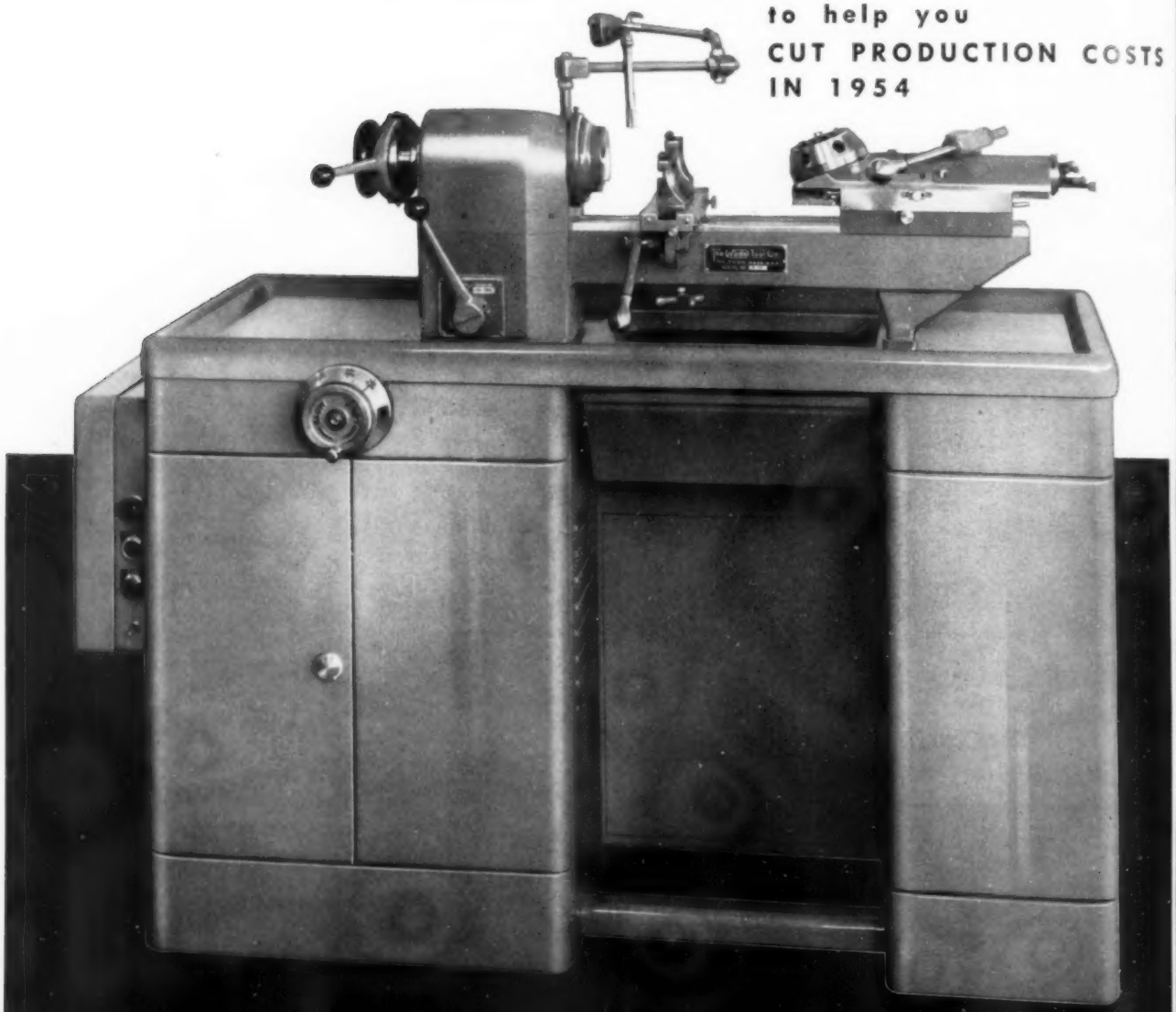

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The Tool Engineer

Your Exposition and Convention Issue

In addition to regular features, this issue contains a preview of your Industrial Exposition and Convention to be held in Philadelphia, April 26-30. Although there is no satisfactory substitute for personal attendance at the show, this issue illustrates the importance of this forthcoming and outstanding event.

Typical of the quality of and the advanced thinking in the papers that will be presented at the Convention, four conference papers are briefed in the technical section. They cover ultrasonic cleaning, plastic fixtures, air gaging and ultrasonic machining. A Philadelphia industrial plant, which is included in the plant tour program, is the subject of an Engineering in Action article. Because of the forward looking nature of the Exposition and Convention, articles are included on the growing importance and specialization of the tool engineering profession, and on trends pointing toward future production methods.

Published on ivory stock, the Exposition section contains a presentation, "What's New," in which new tools and products are discussed and illustrated. This section also contains a floor plan showing booth numbers and a directory of exhibitors, listing their booths and the products being shown.

In the ASTE news section special articles will include a roundup of the week's activities with respect to technical, plant-tour and ladies' programs, and the Exposition.

It is hoped that this method of presentation will be helpful in planning your time at the show to best advantage. If you or members of your staff cannot attend, this issue will inform you of the extent and coverage of the Exposition and Convention so that you can follow subjects of particular interest.

John W Greve

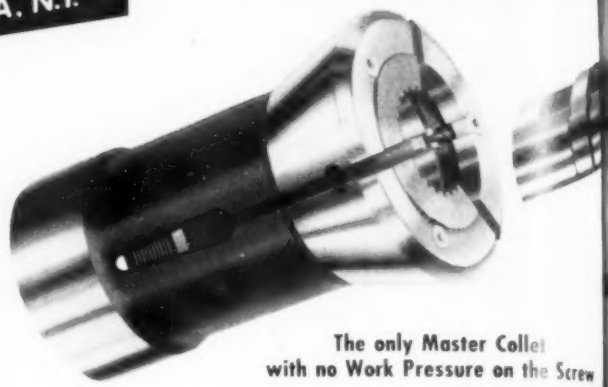
EDITOR

Style "B" Master FEED FINGERS and PADS

HARDINGE
ELMIRA, N.Y.

Style "S" Master COLLETS and PADS

Pads Cannot Work Loose
No Screws No Pins



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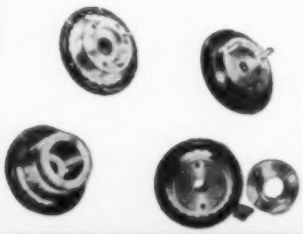
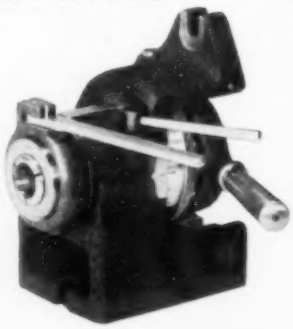
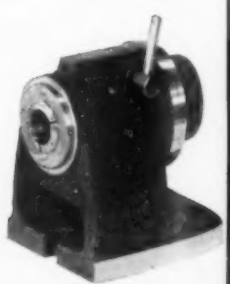


HV-4 Production



H-4 Tool Room-Inspection



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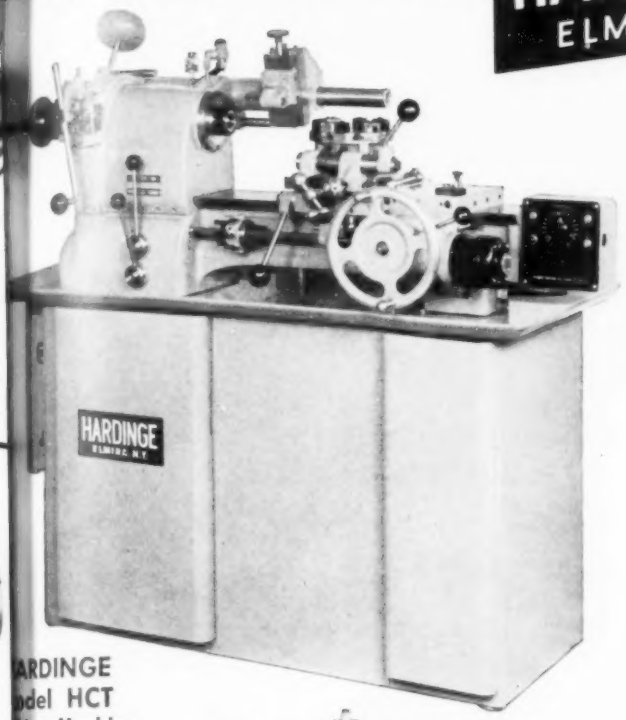

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Production
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Second
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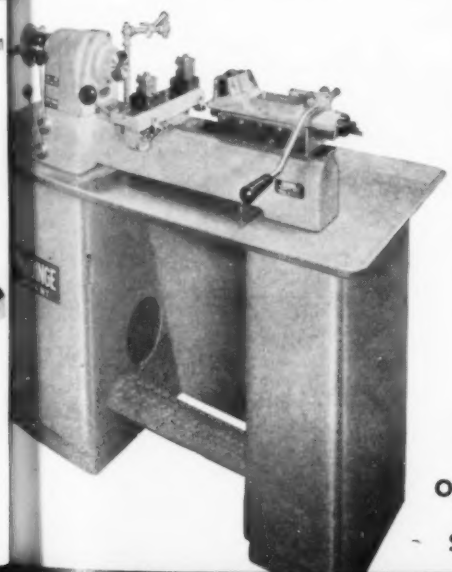

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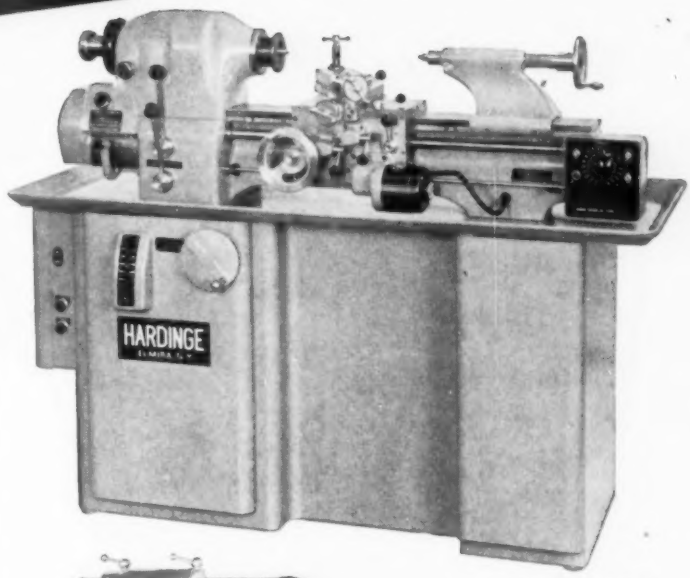

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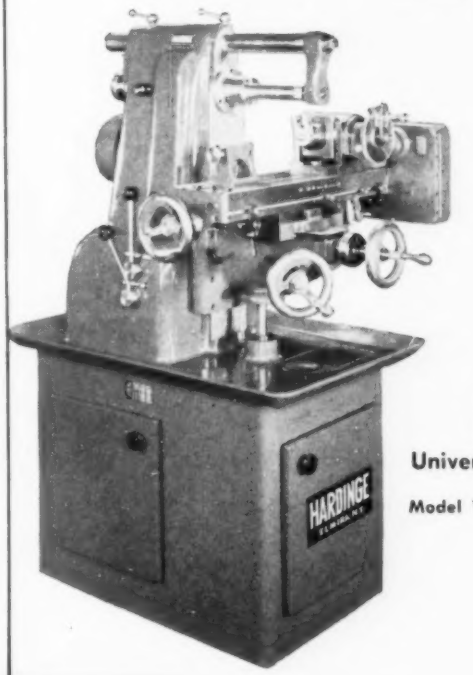
Model HLV
Tool Room Lathe



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Model UM
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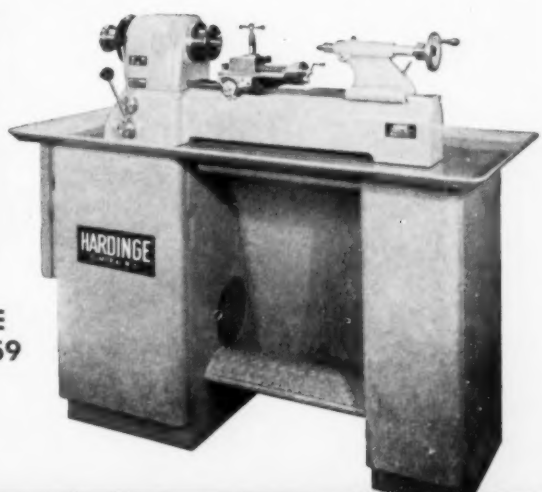
Also
Model TM Plain Milling Machine



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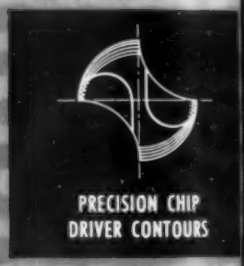

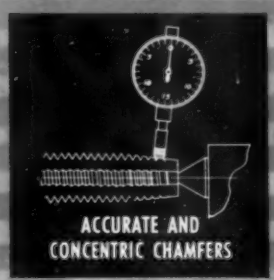

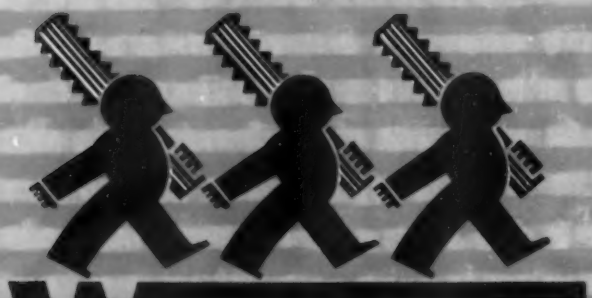

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Improved LANROLL Attachment for Precision Thread Rolling on Automatics

Important improvements for economical thread rolling to Class 4 limits have resulted from changes in the design and construction of the LANROLL Attachment for automatic screw machines.

These improvements, which insure a degree of stabilization between the workpiece and the attachment never previously obtained in a tool of this type, provide:

(1) A well-balanced micro structure of the workpiece through reduced sidewise pressures between the rolls and threads produced.
(2) Low gear-tooth and thrust-bearing loads.
(3) Thread rolling solid to the shoulder with no danger of roll damage.
(4) Longer roll life as rolling wear is distributed equally between the two rolls.
(5) Precision rolling of coarse pitch threads to Class 4 fit without drunkenness.

The improved LANROLL Attachment is furnished in two sizes: the #18 Attachment to permit rolling of #5-44 pitch to ½"—13 pitch threads up to $^{13}/_{16}$" in length; and #20 Attachment for rolling ⅜" —24 pitch to 1"—8 pitch threads up to $^{15}/_{16}$" in length. A new system of size adjustment assures operation of the Attachment for every size within its range as though it were exclusively engineered for the particular workpiece being threaded.

The improved LANROLL Attachment has other important new features: *Attachment Tipping* to avoid indexing interference, allowing a more rugged construction and the use of larger rolls, resulting in an increased number of starts and longer roll life; *Precise Timing* to avoid experimentation or near-guess timing which may result in damage to the rolls on initial rolling; *Adjustment for Taper*, to eliminate any taper which may occur, that can be made without removing the Attachment from the machine.

More complete information will be sent on request. Please send specifications when writing.

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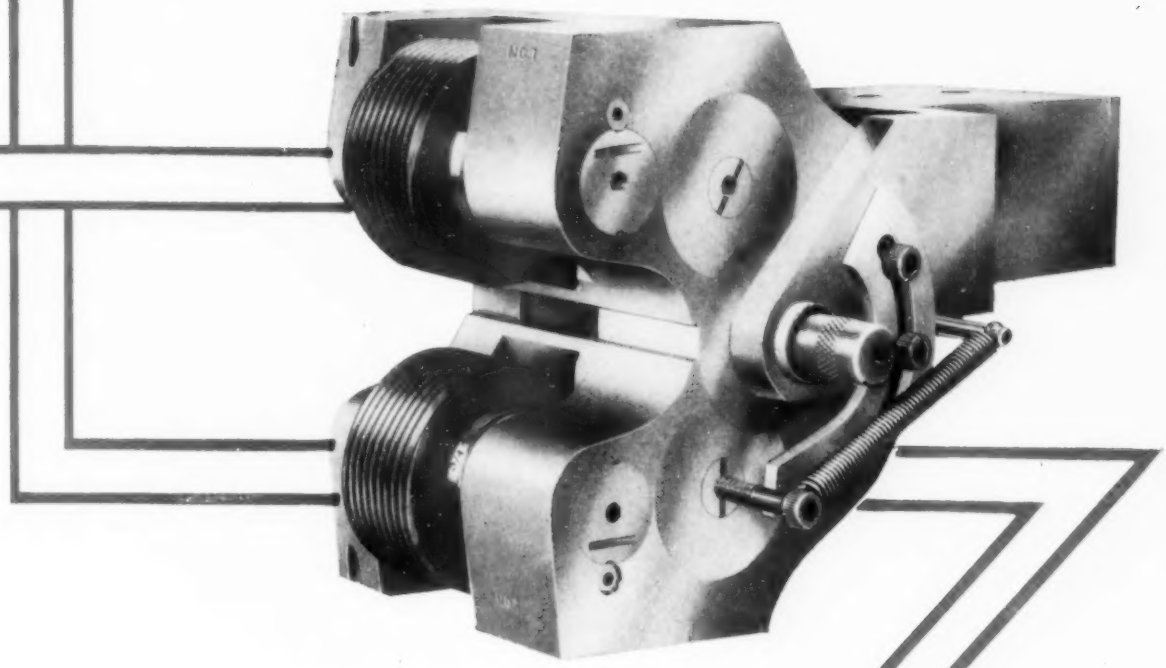
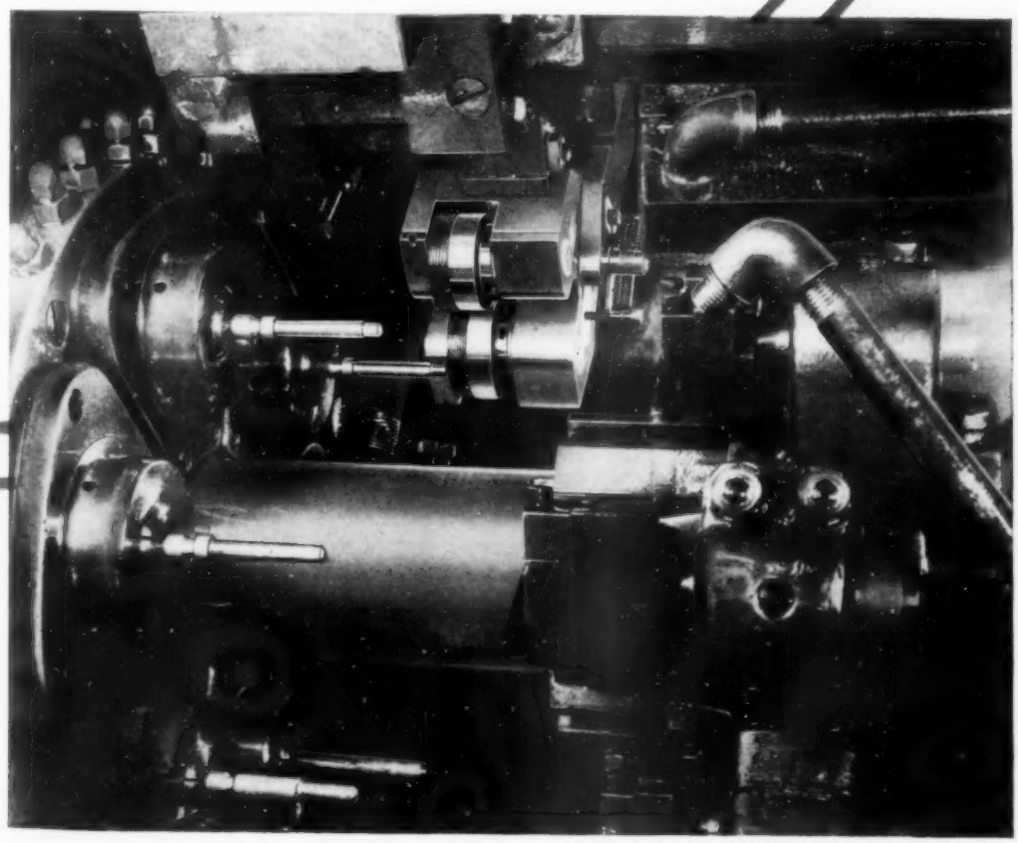
see this
EQUIPMENT
at the
ASTE
Show
BOOTH 1738

379-C



The new #18 LANROLL Attachment is shown on a $\frac{9}{16}$" RA6 Acme-Gridley Automatic at the Mac-it Parts Company in Lancaster, Pa. $\frac{1}{4}$" 20-pitch threads $\frac{9}{32}$" long are being rolled on stripper bolts of 4140 steel to a Class 4 (Class 3 required) fit within .012" of the shoulder with excellent thread finish.



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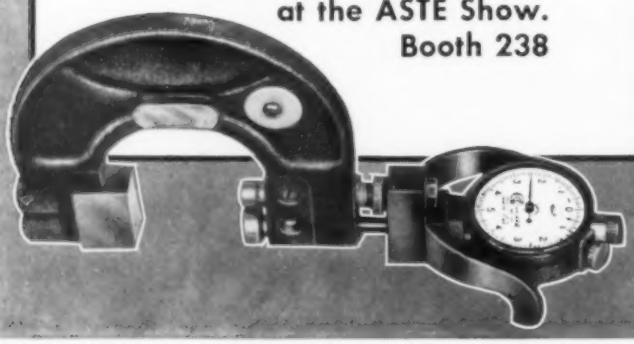

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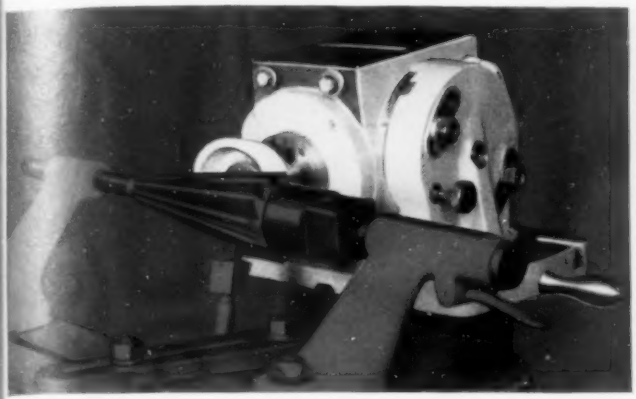

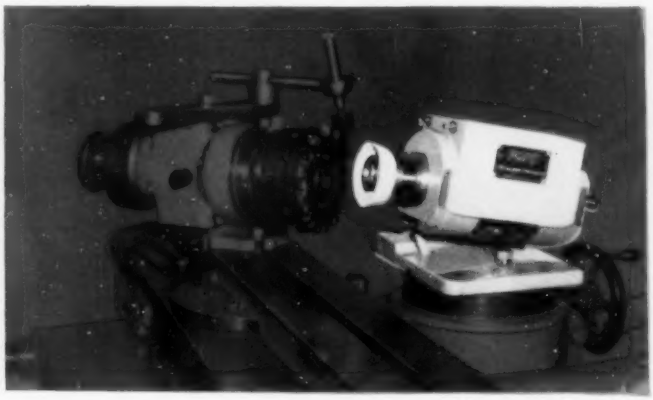

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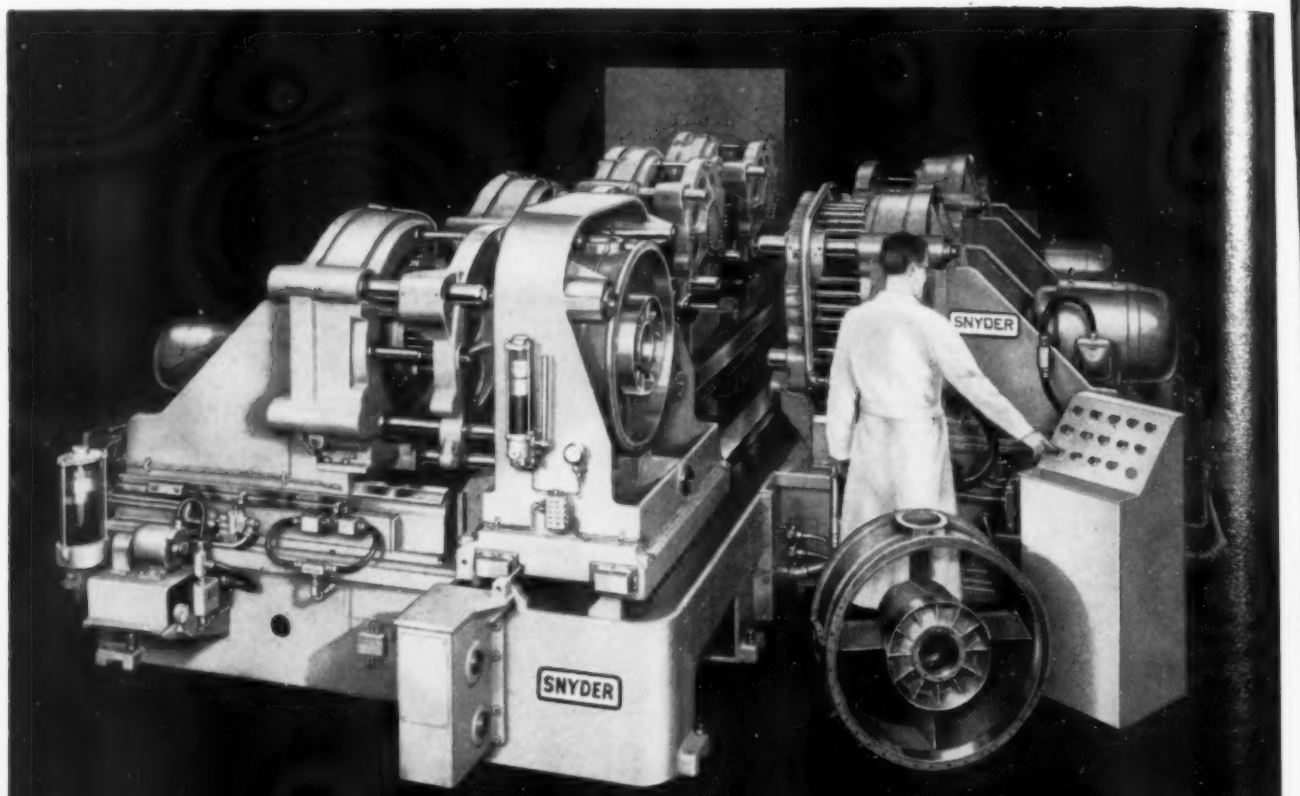

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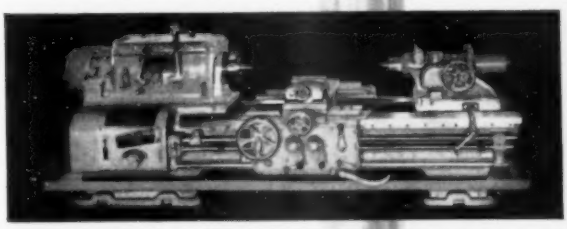

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A

LATHES: ENGINE • TOOL ROOM • HOLLOW SPINDLE • GAP BED • PETROLEUM PUMPING EQUIPMENT: DEEP WELL PLUNGER PUMPS • SUCKER RODS • HYDRAULIC LONG STROKE PUMPING UNITS • AIRCRAFT COMPONENTS

1 ***NEW*** **Standardized Hole Location Gage** — Model 205 checks location, alignment and concentricity of a hole with relation to another hole, a surface or a preselected reference. Gage is a more universal type than former models.

2 ***NEW*** **Airprobe** — Calibrated on regular Dimensionair. Available in .003″, .006″, .015,″ .030″ ranges. Self-zeroing. Factory calibrated: no calibrating devices needed. Spindle travel .140″ total. Long overtravel. Water- and oil-proof.

3 ***NEW*** **Gear Gage** — Model 202P-22 — Pitch Diameters are quickly and accurately inspected with this new gage. Anvils contact pitch line of teeth accurately. Long range upper anvil. Latter is *not* affected by the lifting lever or by the weight of gage.

4 ***NEW*** **5000 to 1 Magnification Dimensionair** — Graduated .000020″–.0015″ Range. Long "approach range", calibrated dial, only one master required.

5 ***NEW*** **Crankshaft Gage** — Model 1340P-40 — It's thin — gets in between shoulders and right up to sides of bearings. Anvils are flat. Has same built-in pantograph contact as Federal's 1340 Snap Gage.

6 ***NEW*** **Arnoldair** — This Gage makes the Arnold Grinding Gage even better. Operator can split tenths easily and produce more precise work. Try it on one grinder and you will want it on all.

7 ***NEW*** **Wetproof Dial Indicator** — Use it on tough assignments, under oil and water without damage or loss of accuracy.

Photo shows our booth at previous A.S.T.E. Show. This year's booth 250 sq. ft. larger.

AT Booth 321...

DON'T MISS IT!
1954 INDUSTRIAL EXPOSITION
PHILADELPHIA CONVENTION CENTER
APRIL 26-30 incl.

Gaging Instruments

8 *NEW* Shallow Diameter Universal I.D. and O.D. Gage — Model 88P Series — Designed especially for gaging shallow diameters and shoulder diameters (either inside or outside). Adjustable for length and for depth of measurement. Rigid, accurate and inexpensive.

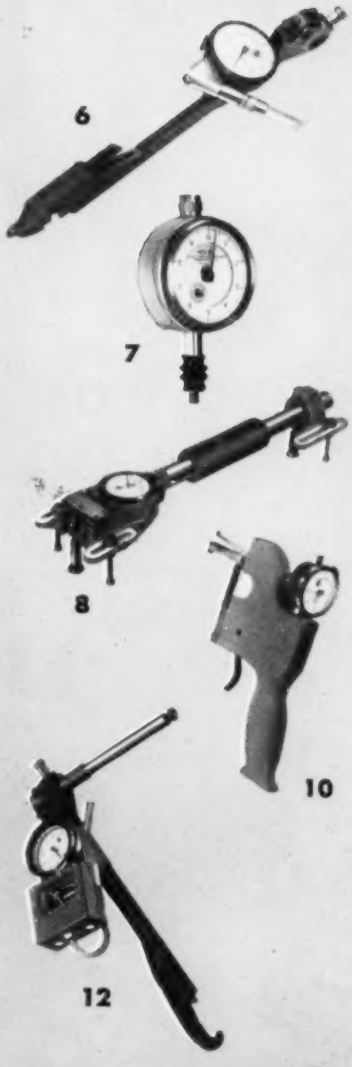
9 *NEW* Adjustable Air Hole Gage — This gage is adjustable to various sizes of inside diameters and is provided with centralizers. Eliminates need for a single size air plug for every hole size. (No photo available: See demonstration at the Show.)

10 *NEW* "0" Ring Gage — 36P Extra large capacity. Simple to use and to maintain. Light, handles "nice"; not cumbersome. Very economical gage.

11 *NEW* Automatic Hole Sorting — Demonstration of Air Gaging combined with Electronics for automatic *gaging* by air and automatic *sorting* by electronics. (No photo available: See demonstration at the Show.)

12 *NEW* Air-Electric Machine Control — Controls accuracy of machine feed automatically. Can be applied to various machine tools.

. . . and many other modifications and developments of modern gages for inspecting, sorting, and machine dimension control. Be sure to see us at Booth 321. **Federal Products Corporation, 4194 Eddy St., Providence, R. I.**



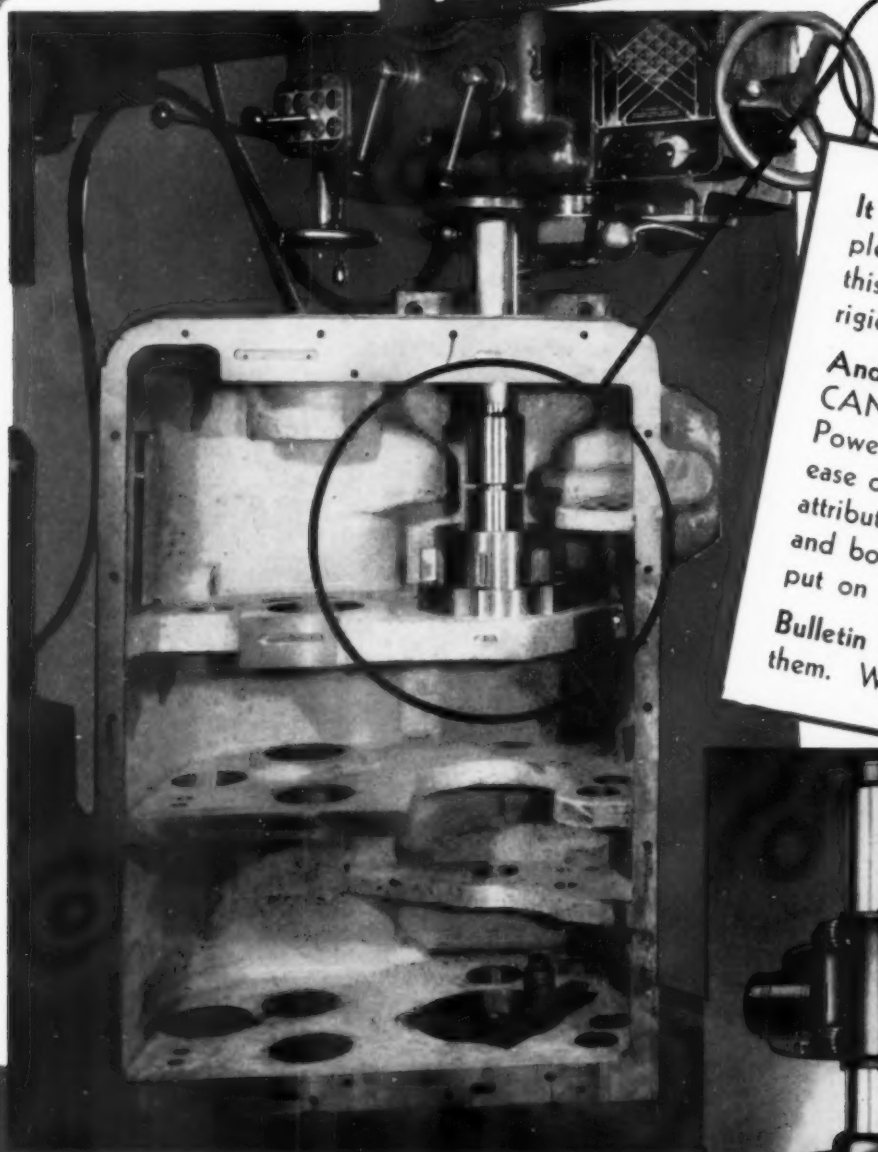
Ask FEDERAL

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting or Machine Size Control

A GOOD SPINDLE

FOR GOOD BORING AND TAPPING . . .

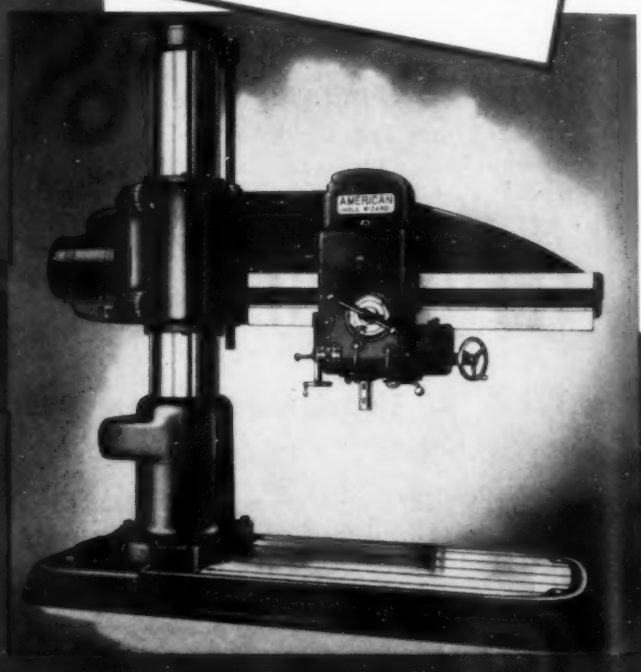


Here's a 10" tapping job on a 5-foot "AMERICAN" Hole Wizard Radial

It takes a sturdy, rigid machine with plenty of power to do work like this. Especially does it require a rigid and smooth-acting spindle.

And that's exactly what "AMERICAN" Hole Wizards are noted for. Power—rigidity—convenience and ease of control are "AMERICAN" attributes that cut drilling, tapping and boring costs wherever they are put on the job.

Bulletin No. 327 tells all about them. Want one?



THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drilling Machines

Production Pointers from GISHOLT

GISHOLT

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

TWO OPERATIONS ON ONE MACHINE...WITH ONE SETUP

Fastermatic Double-Chucks Part

This is a bit tricky, but note how these couplings are produced without tying up two machines or running up increased costs through needless changeover time.

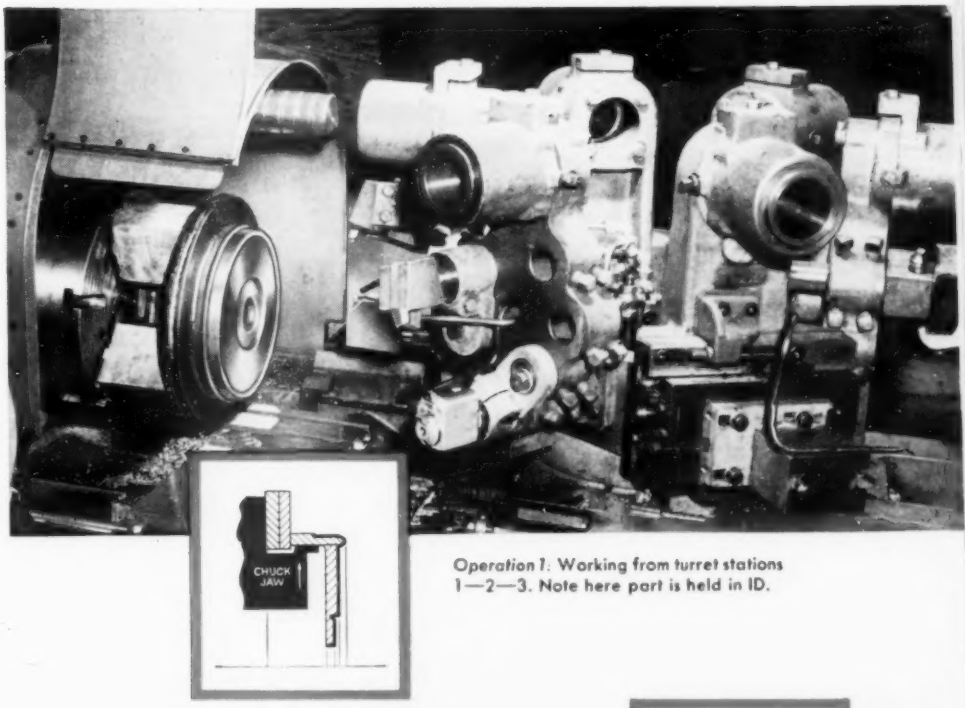
The part requires two machining operations; two chuckings. The problem of how to do it on one machine using *one* tool setup was solved with a 2F Fastermatic Automatic Turret Lathe.

Here's how:

Operation 1—this consists of turning, facing, boring and chamfering from turret stations 1—2—3. The part is held in the ID with an air chuck. With this automatic cycle completed, the spindle stops and the workpiece is turned around and rechucked in the same jaws—except that now they hold on the OD.

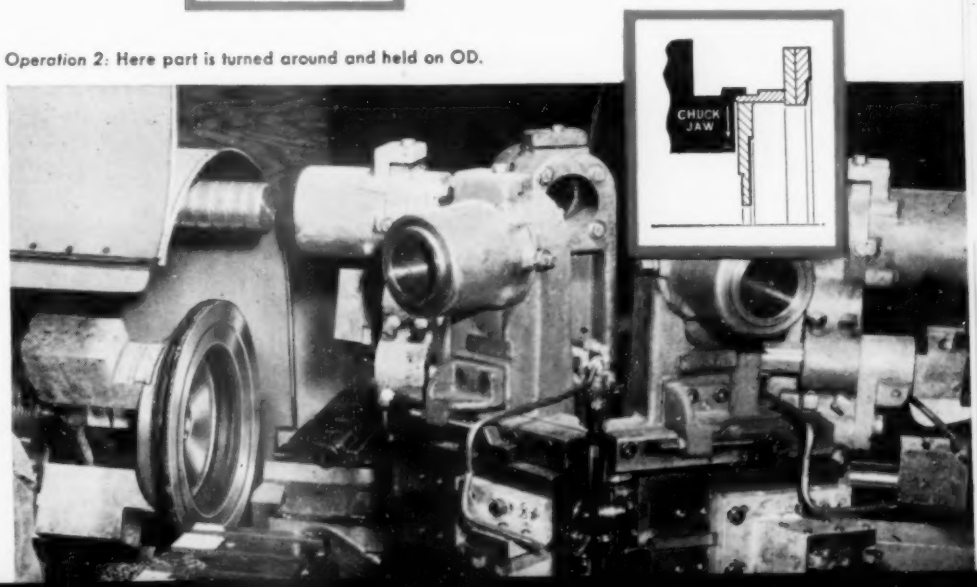
Second Operation—the machine is started and automatically goes through the new machining cycle. Turret stations 4—5—6 rough and finish face on the other side, completing the part.

Obviously, this single-tooled, switch-around idea is not applicable in many cases. Yet, it is worth remembering. And so is the unusual versatility of the Fastermatic Automatic Turret Lathe which can account for reduced machining time and costs in many jobs.



Operation 1: Working from turret stations 1—2—3. Note here part is held in ID.

Operation 2: Here part is turned around and held on OD.



The Fastermatic Automatic Turret Lathe does this unusual job easily and fast with both operations handled in one setup.

PROFIT INSURANCE

GISHOLT

TIME-SAVING IDEAS

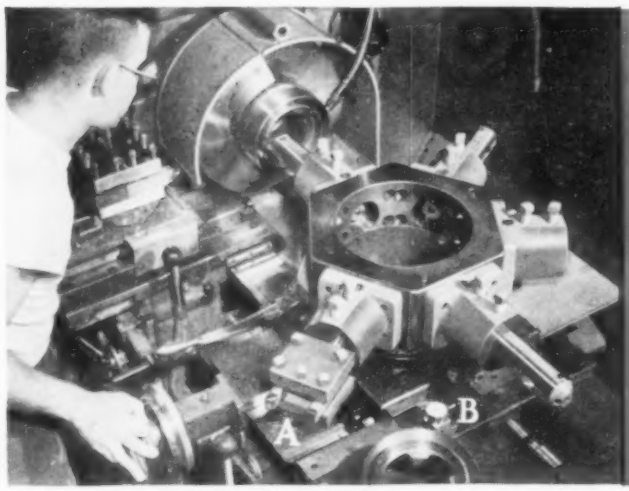
REDUCING TOOL COSTS ON DOUBLE-OPERATION WORK

C/F Turret Permits Simpler Tooling on Saddle Type Lathe

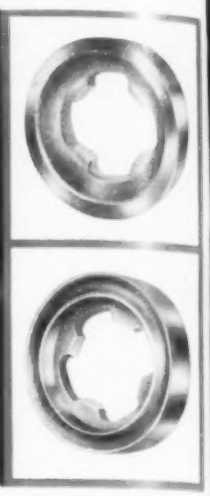
Here's a case where the producer wanted to handle first and second operations on one machine and do it with the simplest, most inexpensive possible tooling. The part is a 7½" commutator clamp. A Gisholt 1L Saddle Type Turret Lathe was given the job because there is considerable stock removal...and because it could be equipped with a cross-feeding hexagon turret to simplify tooling.

The drawing shows the surfaces machined in the two operations. Short flanged tool holders on the hexagon turret permit changeover in just minutes. The photo shows the setup for the second operation. Note the standard turret tool holder (A) which holds two cutters to finish the two faces of the outer rim. The cross-feeding turret handles both in one pass. This saves time and it insures dimensional accuracy.

One bore has a particularly critical diameter. Setting the hexagon turret cross slide with the dial indicator (B) insures the precise dimension.

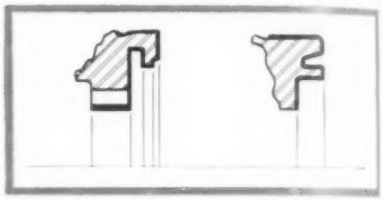


Machine view showing second operation.



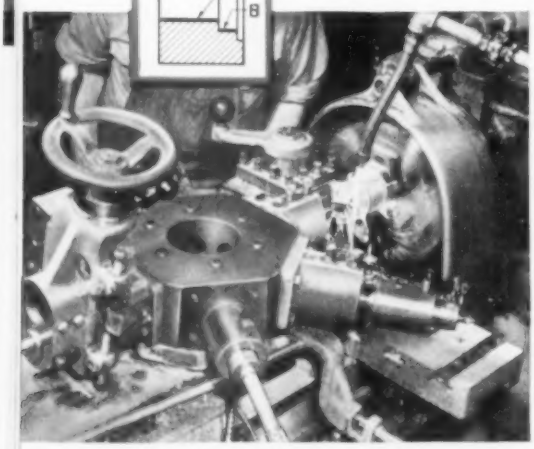
Finished piece, first and second operation.

Another example of how the cross-feeding turret on the Gisholt Saddle Type Turret Lathe can save time and reduce tooling costs on a variety of work.



A SIMPLE JOB MADE EVEN SIMPLER

Quick Change of Spindle Speeds Saves Time, Effort, Money

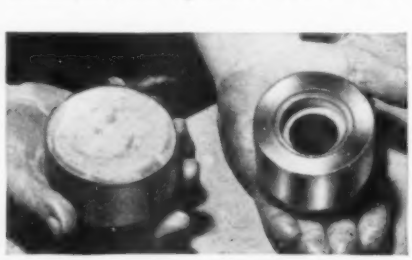


Working at 402 r.p.m., the operator will get reaming speed by merely tapping the HI-LO lever, shown below.

This would be a simple enough job in any shop. But here, the important differences in time and effort show up with the operation of the ram type machine. With the No. 5 Ram Type Turret Lathe, equipped with the Gisholt Hydraulic Speed Selector and HI-LO Trip Lever, time and effort are reduced to the barest minimum.

The reasons: (A) is first drilled and then bored from the hexagon turret. This work is done at 402 r.p.m. Then reaming is done. Here, with most machines, the operator would have to shift headstock gears to the new and lower spindle speed. With the Gisholt No. 5 Ram Type Turret Lathe, the operator just taps the HI-LO lever. Instantly the Hydraulic Speed Selector makes the shift. Even before the reamer is in working position, the spindle is turning at the correct speed—69 r.p.m. in this case.

Once the reaming is done, the operator again trips the HI-LO lever and while the turret is indexing, the Hydraulic Speed Selector automatically makes the shift back to 402 r.p.m. Then counterbore (B) is started.



Rough workpiece and completed part.

The Gisholt Hydraulic Speed Selector not only saves time and physical effort in changing speeds, but it also reduces floor-to-floor time. That's another good way to cut costs.

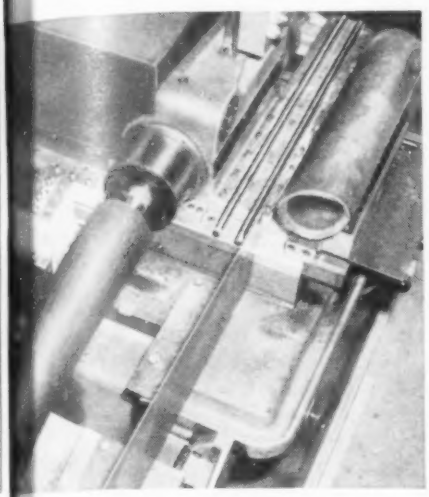
SOUND PROFIT INSURANCE

GISHOLT

TIME-SAVING IDEAS

SMART LOADING METHODS LIKE THIS WILL SAVE YOU TIME

Simplimatic Automatic Lathe Uses Slide to Aid Handling



With part completed, it is moved out on the rails and then onto the conveyor lines. New workpiece then is rolled onto the rails and pushed on arbor. Sketch below shows complete sequence.

This was not a matter of faster cutting, but faster "handling time." The workpiece is a 155 mm steel shell body. The machine is the Simplimatic Automatic Lathe. The job itself is simple: face down to the boss and cut off to length.

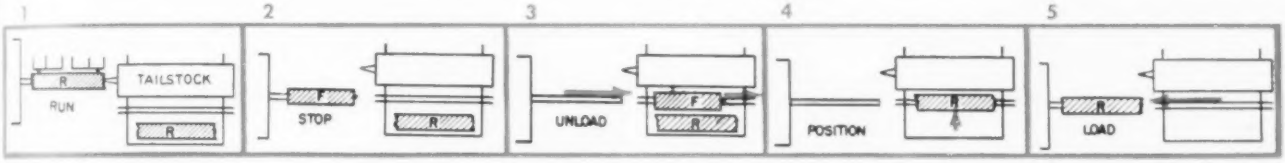
Most interesting is the expert work-handling method—a simple device that greatly increases machine use and hourly production by reducing loading and unloading time.

Step by step, the job goes like this: the slide with tailstock is retracted. Rails mounted on the slide guide the rough workpiece as it is loaded on the arbor. The slide then moves forward and the tailstock quill supports the work.

While the rear tools make chips, the operator places a new rough workpiece on the ramp at the front of the slide. With machining completed, the tailstock quill automatically retracts and the slide moves back. The finished part is moved off the arbor onto the rails and then to a conveyor line. Onto the rails goes the waiting rough workpiece and then on the arbor. The tailstock slide comes into position; the next piece is begun.

This job could easily take 20% to 40% longer without this efficient handling arrangement—even with the same machining time. Gisholt engineers have had extensive experience in solving loading problems. Let them help save time on your jobs of this kind.

The tailstock slide on this Simplimatic also carries loading-unloading rails which quickly position the work and ease the manual burden.



ALUMINUM IMPELLERS GET FAST MACHINING

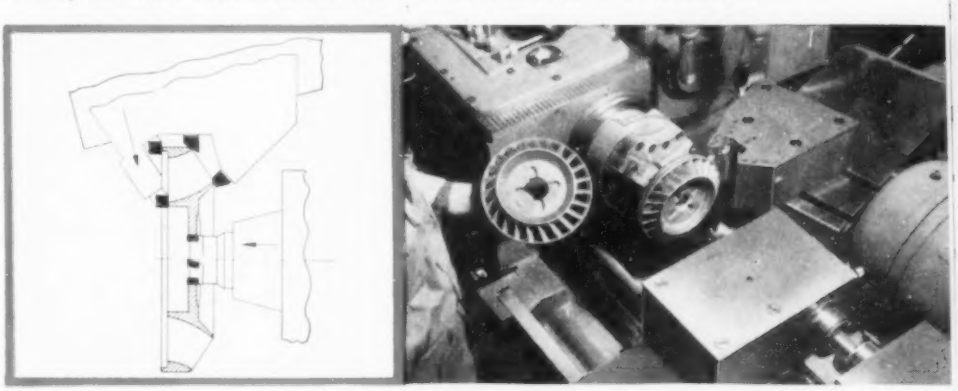
No. 12 Hydraulic Automatic Lathe does it in 10 Seconds

Split-second efficiency is a must on this job—machining operations on two different impellers for a popular car's automatic transmission. While the work is small, the volume is great. So, every second counts.

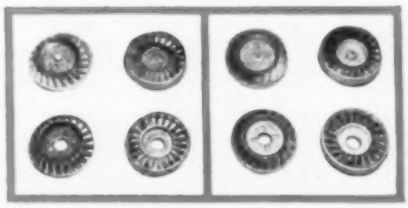
Only one No. 12 Hydraulic Automatic Lathe is needed to handle the entire output. With the workpiece located in the 3-jaw air chuck, the spindle is driven at 900 r.p.m. The workpiece center is then removed by trepanning under oil mist lubrication. A speeder drives the trepanning cutter by means of a sliding sleeve arrangement on the front carriage. Longitudinal carriage movement carries the cutter to and from the work, allowing clearance for loading.

The balance of the work is done with four tools in a single tool block on the rear slide. This slide moves in at an angle so that both back faces may be shaved at once.

Time is just ten seconds floor-to-floor. The No. 12 Hydraulic Automatic Lathe performs with speed and economy on all jobs working with all metals. It can give you the high production and low cost you want in your work.



The flexibility of the No. 12 Hydraulic Automatic Lathe permits the kind of tooling which reduces this job to only two simultaneous straight-line motions.



Top panels show both sides of rough parts; the completed parts are below.

Write for complete catalog of No. 12 Hydraulic Automatic Lathe.

GISHOLT

TIME-SAVING IDEAS

CYLINDRICAL PARTS BALANCED IN OVERHANGING POSITION

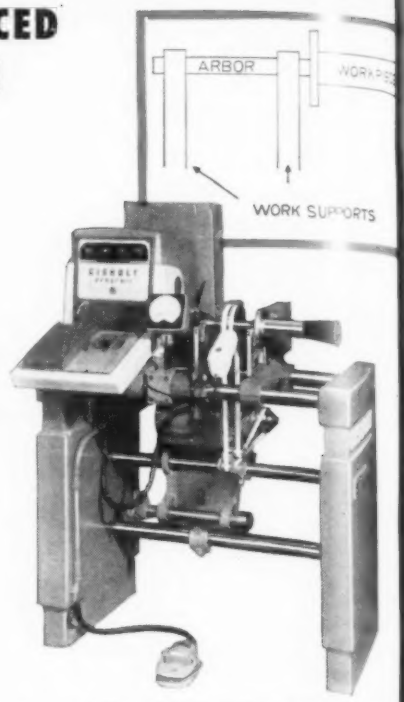
Improved 1S DYNETRIC Balancer Simplifies and Speeds up Two-Plane Balancing

The spinners used in textile mills must be dynamically balanced because of their high-speed rotation. Here, a rayon spinner, a workpiece typical of those which do not carry their own shaft, is being balanced on the Gisholt improved type 1S DYNETRIC Balancing Machine. The spinner is mounted on an arbor and balanced in an overhanging position. This simplifies loading and unloading since the arbor is not removed from the work supports. Simple left or right switches simultaneously indicate the location and amount of material to be removed in each correction plane. Correction is made after removal from the arbor. Production balancing of overhanging workpieces such as this is a simple operation on Gisholt Balancing Machines. Unbalance is quickly and accurately measured and located for correction.

The machine-mounted arbor permits balancing of overhanging parts and speeds up loading and unloading.

NEW CATALOG covers the improved and more complete line of Type S DYNETRIC Balancing Machines. It has full information and illustrates many interesting jobs. Write for your copy.

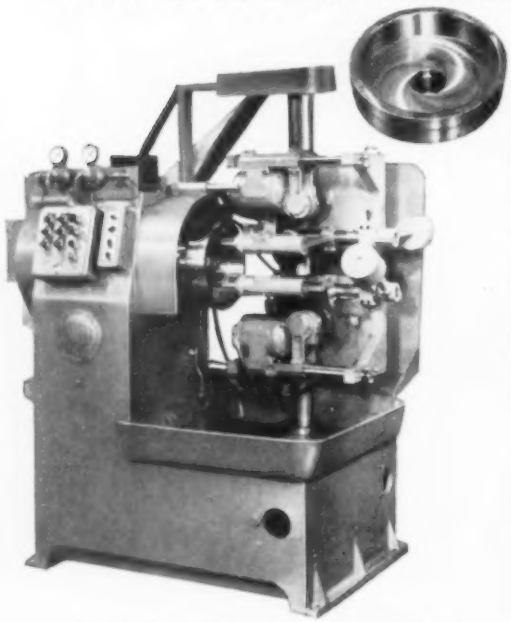
DYNETRIC BALANCERS



Improved Type 1S DYNETRIC Balancing Machine with loaded workpiece. Drawing shows permanently mounted arbor on work supports.

AIR CYLINDERS GREATLY IMPROVED BY SUPERFINISHING

ID Surface Handled in One Quick, Automatic Operation

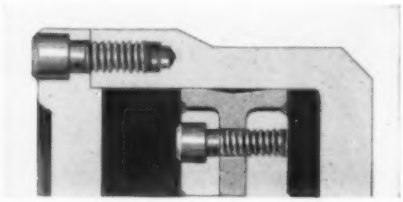


Model 79 Superfinisher showing stone holders in working position. Above, part ID is Superfinished; reflections are from true base metal.

This is one of our own applications of Superfinish. The part is the air cylinder used with Gisholt air-operated chucks.

To give maximum efficiency to these cylinders, we turned to the practical expedient of Superfinishing. The result is an ID surface that allows far less blow-by, and that greatly extends packing life. At first the parts were Superfinished in our Superfinishing laboratory. Then, to do the job on a production basis, a special automatic machine was designed, the Model 79 Superfinisher. It has large capacity with variable speeds and oscillation rates. For rapid loading and unloading, it is equipped with an air chuck.

In one fast, automatic operation all Gisholt air cylinders are Superfinished to make them better performing, longer serving.



Superfinish of the ID reduces blow-by and increases packing life.

SURFACE FINISH—its problems and how they are overcome by Superfinishing are fully covered in new catalog. Write for your copy now.

No. 3-454

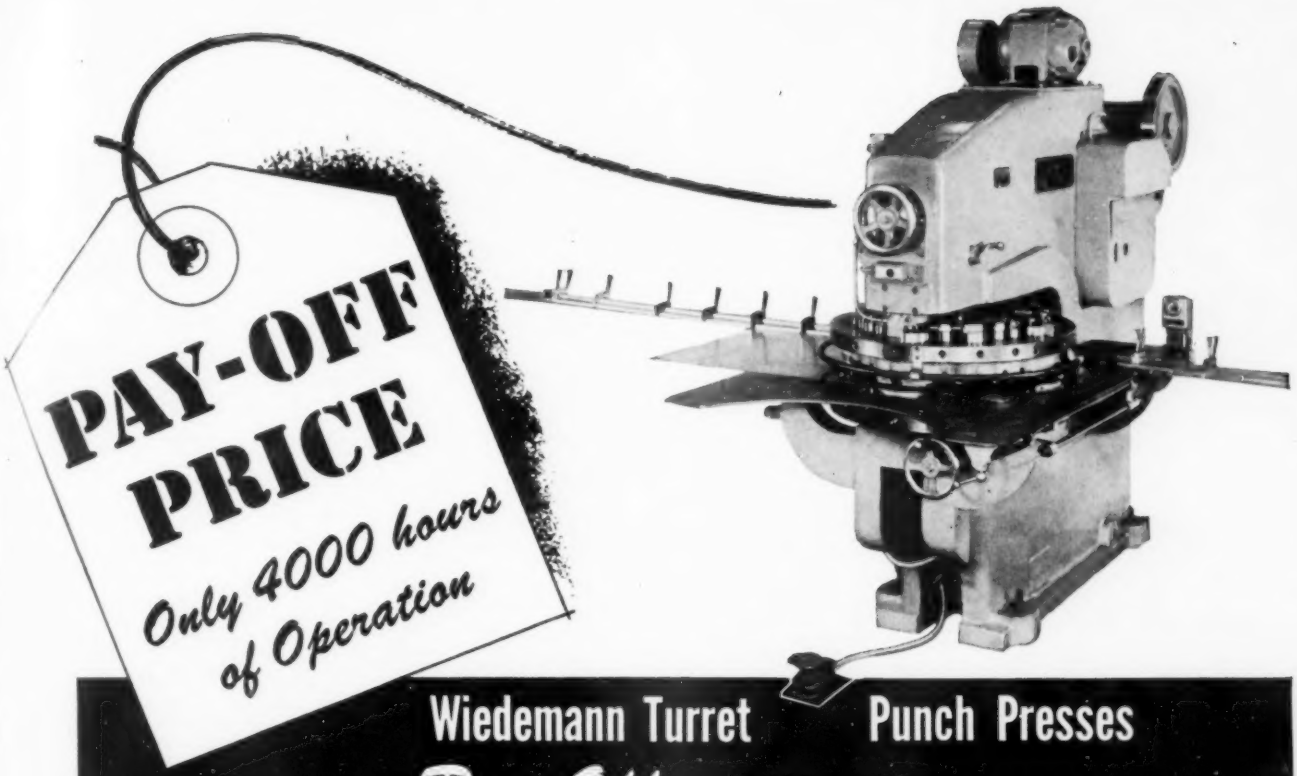
624

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Write for your copy of Gisholt's new general catalog.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Wiedemann Turret Punch Presses

Pay Off **IN TWO YEARS OR LESS . . .**

(4000 hours of operation)

precision-pierced parts of these and similar products are produced in small lots with low tooling cost

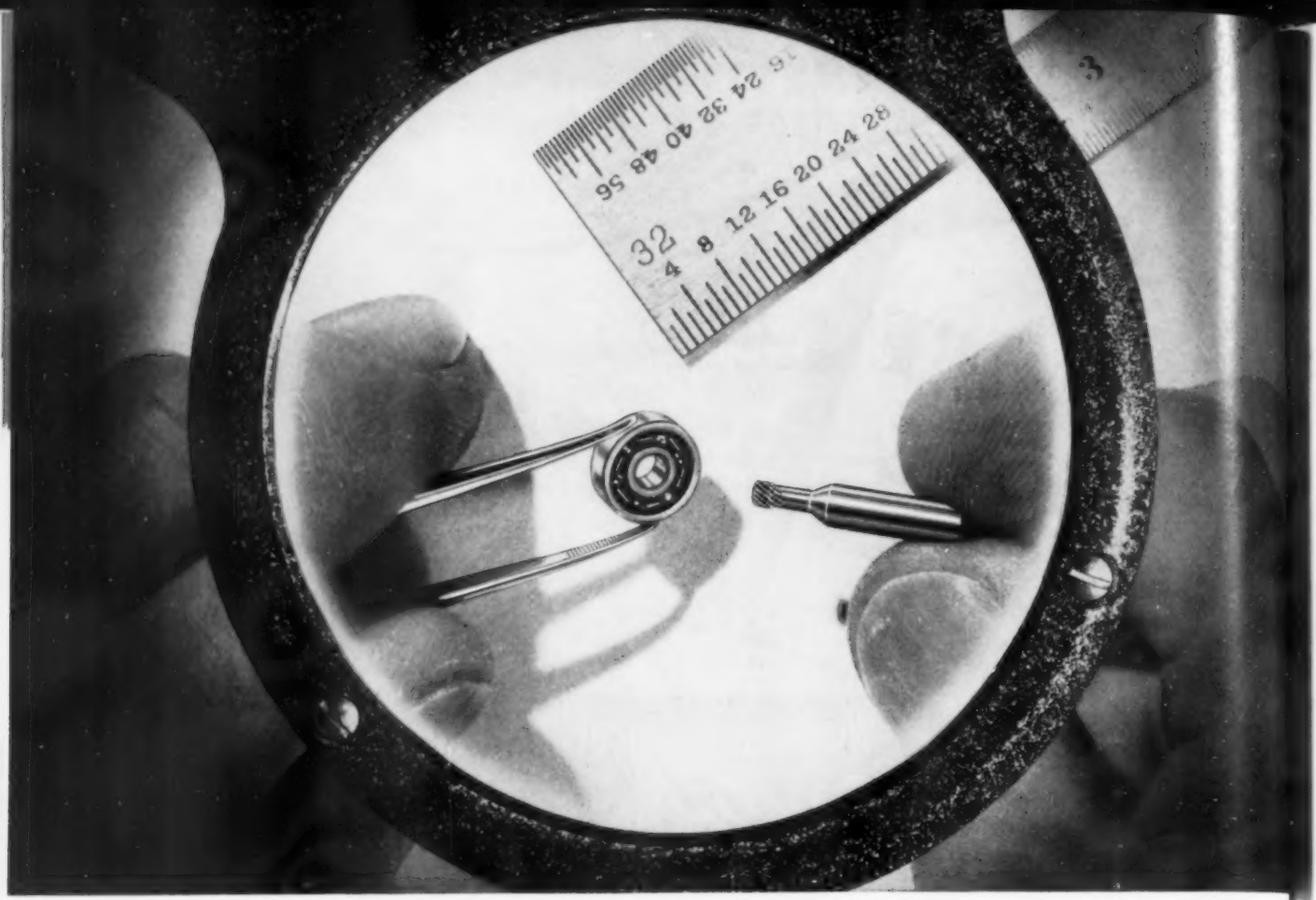
WITHOUT LAYOUT—WITHOUT SET-UP

A WIEDEMANN PIERCES SMALL LOTS COMPLETE, IN LESS TIME THAN LAYOUT BY CONVENTIONAL METHODS

We'll gladly make a time study on your work.

WIEDEMANN MACHINE COMPANY

4245 Wissahickon Avenue, Philadelphia 32, Pa.



For Finishing Small Holes

(Down to .032" dia.)

ECONOMICALLY . . .
OVER 2,000 PIECES PER BUR

RAPIDLY . . .
AS LITTLE AS 30 SECONDS PER PIECE

ACCURATELY . . .
TO .0002" FOR SIZE AND 50 MILLIONTHS FOR ROUNDNESS

You can't beat a KELLERFLEX CARBIDE HOLE FINISHING BUR

Small hole finishing with Pratt & Whitney KELLERFLEX Burs is superior to all other methods. In actual production, a single bur has finished as many as 3,000 holes in hardened steel bearing races . . . compared to only 7 for mounted points. Only Kellerflex Carbide Hole Finishing Burs, engineered and master machine ground for precision and concentricity, can deliver this cost-cutting performance.

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To The A. S. T. E. SHOW!
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MACHINE TOOLS • CUTTING TOOLS • GAGES

If time meant money he'd drill and tap with

Bellows-Locke DRILL UNITS

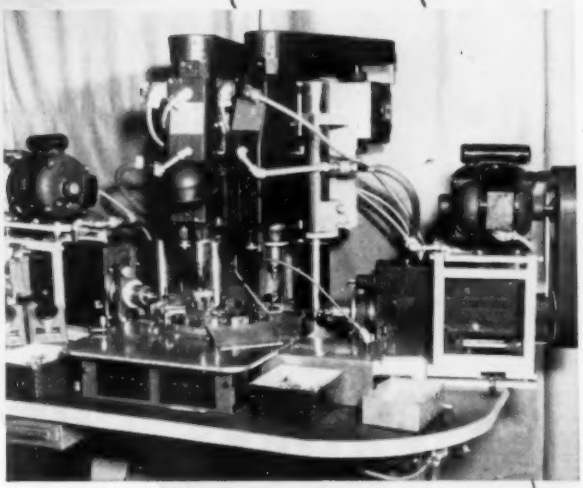
An extra second or so drilling a hole may not mean much to a woodpecker. But in today's cost picture it means dollars to you.

If you have any part in which you are drilling or tapping two or more holes in any size up to 1/4" or 5/16", The Bellows-Locke Drill Unit offers practical opportunities for substantial cost reduction.

It is particularly effective as a basic component for toolroom-built special purpose drilling and tapping machines. It is compact, streamlined, relatively light in weight, can be installed in any angle in any plane. Any number of units can be easily synchronized and interlocked for accurately timed sequence operation.

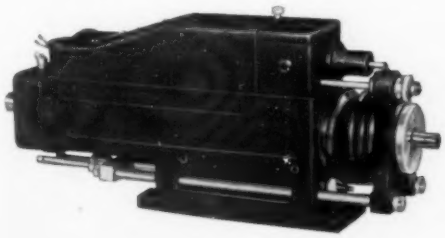
The spindle is electrically driven (either pulley drive or direct motor drive). Rapid advance and retract is by pneumatic power. Feed rate is hydraulically controlled. All three circuits: electric, pneumatic and hydraulic are interlocked for simple, positive push-button control.

Major cost reductions are often the accumulated total of many minor savings. Look at your drilling and tapping costs with a critical eye.



WRITE FOR THIS BOOKLET—

Describes the Bellows-Locke Drill Unit in detail—shows how and where it can be used to best advantage. Free on request. Address: The Bellows Co., Dept. TE-454, Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., 4972 Dundas St., W. Toronto, Ontario, Canada.



The Bellows Co.

AKRON, OHIO

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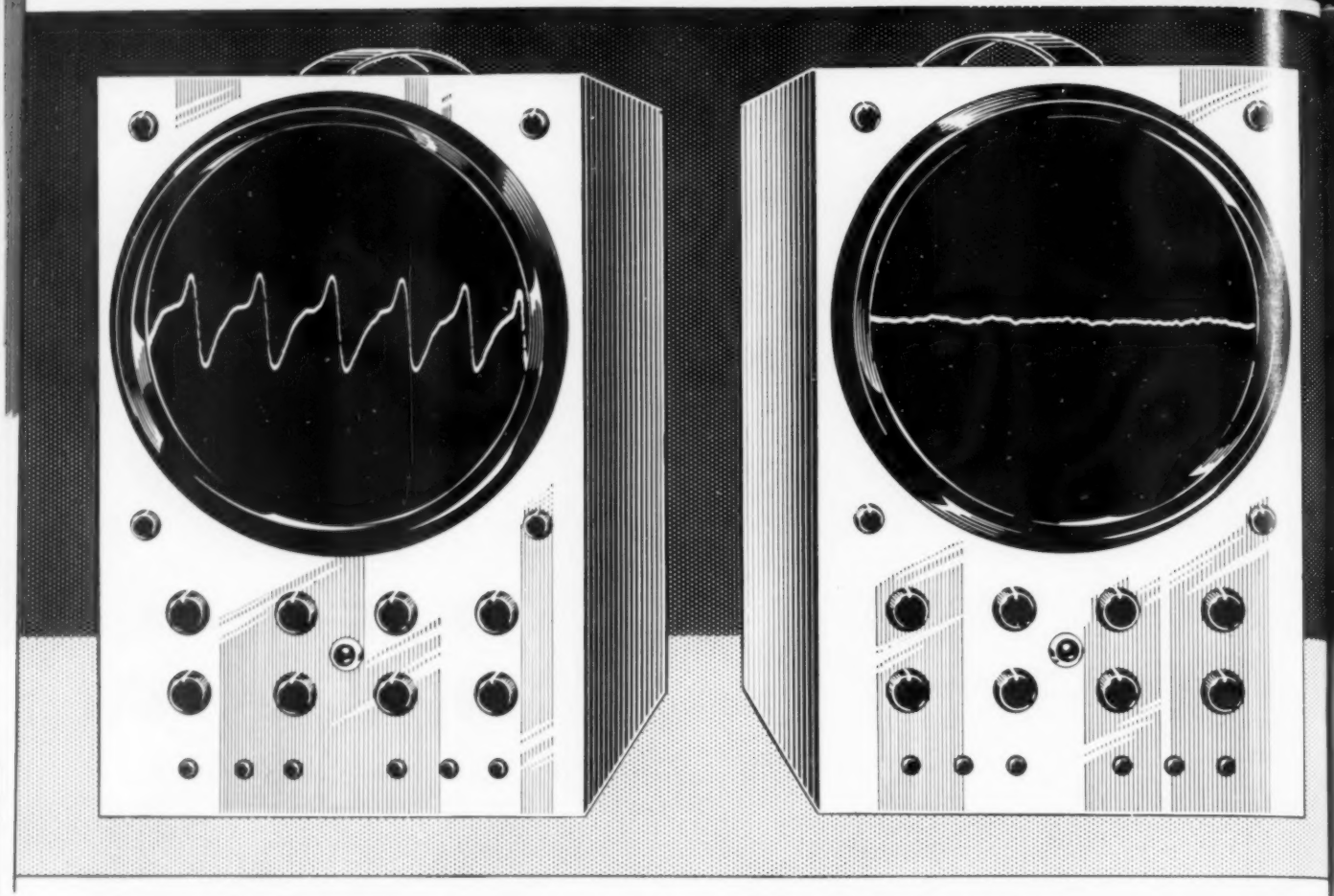

WHEN A STRAIGHT MINERAL OIL was used to lubricate the ways, an 0.0008″ jump at frequency of 2.74 cycles per second was noted.

WHEN SUNOCO WAY LUBRICANT was used on the ways, the jump was too small to measure, proof that this medium stops slip-stick motion.

TEST PROVES SUNOCO WAY LUBRICANT ENDS SLIP-STICK TABLE MOTION

How effectively Sunoco Way Lubricant stops slip-stick table motion is graphically illustrated by these oscillograms. The pattern on the left was made with a straight mineral oil as the lubricant; the other was made with Sunoco Way Lubricant on the ways. Both patterns are magnifications of changes in rate of table travel and were obtained under identical conditions.

You can stop slip-stick table motion, protect the ways, get better surface finishes, cut production losses with Sunoco Way Lubricant. Try it in your shop. For more information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. TE-4.

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SUN OIL COMPANY

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Your Higher ORIGINAL COST RESULTS in LESS COST per PIECE!

Actual Job

Caterpillar Tractor Co.

Part Name..Cutting Edge Bulldozer Scraper Blade

Operation Description...Form Edge Scraper Blade

Machine Model—Type..Rockford Planer Series #4

Tool Type.....MX-7 Multicut Planer Holder

Planing Speed.....100 S.F.M.

Feed.....025

Depth of Cut.....0 to 7/8" Max.

OLD H. S. STEEL METHOD	NEW WESSONMETAL METHOD
Pieces per Grind.....½ to 1	Pieces per Grind.....13½
Total Tool Cost.....$49.25	Total Tool Cost.....$97.16
Average Pieces per tool life.....24 Pieces	Average Pieces per tool life.....324 Pieces
Tool Cost per Piece.....$.60	Tool Cost per Piece.....$.07

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We invite you to come in and see the amazing Robot Show in our auditorium at the A.S.T.E. Industrial Exposition, Philadelphia, April 26-30, 1954.

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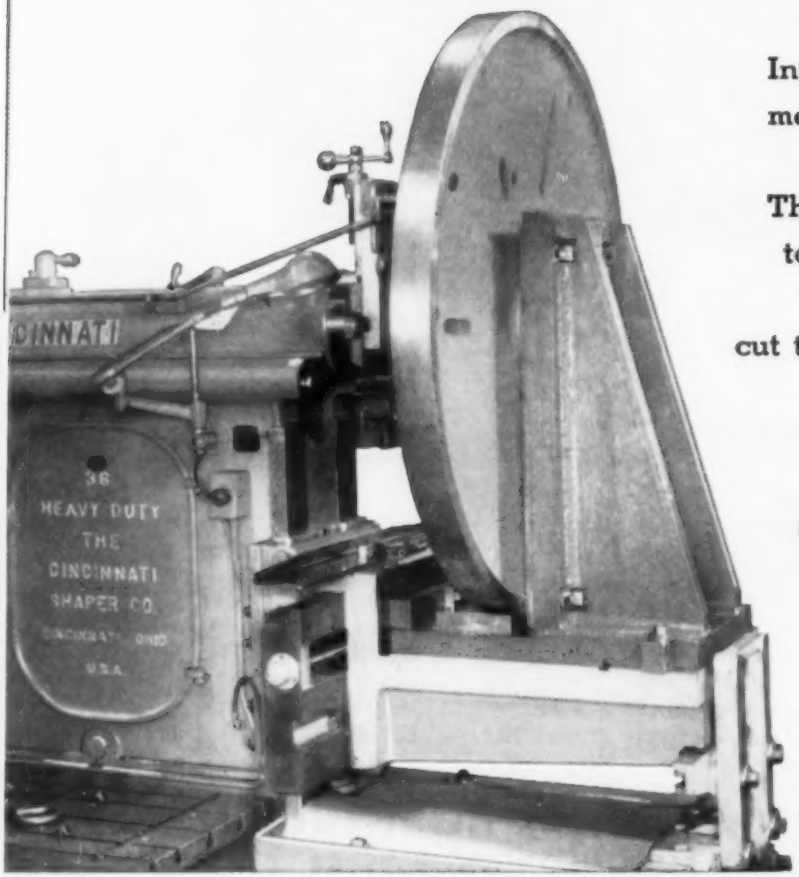
INTERNAL SHAPING

the LARGE



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This large job is especially adaptable to this rigid Cincinnati Shaper with "drop" table. Kennedy keyways are cut to .0005" tolerance in this big gear. The low cost fixture and tool make this job profitable and simple.

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- Internal contouring.
- Internal teeth on special gears.
- Internal guides in gate valves.
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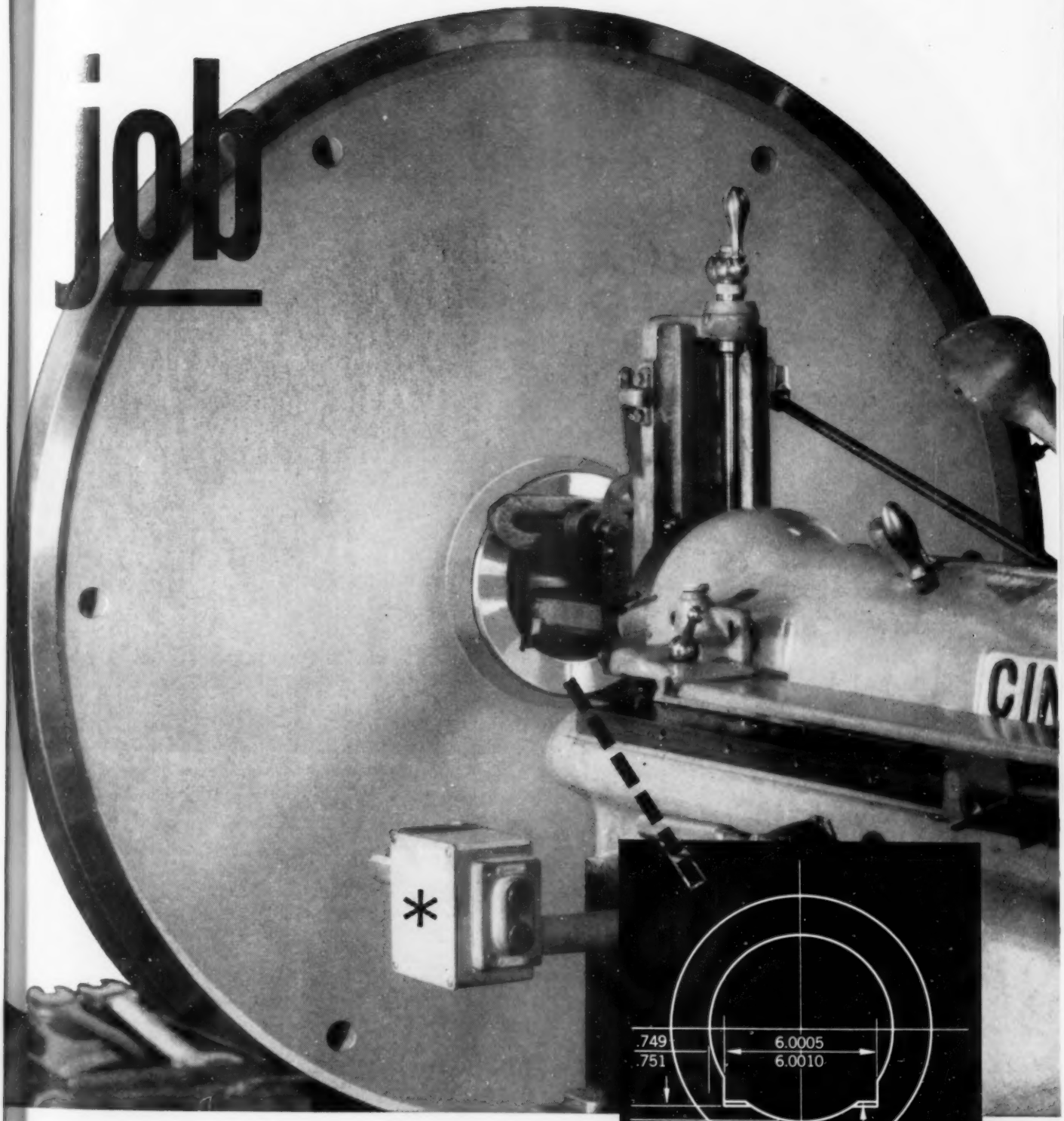
job



* The new Electro-Magnetic Clutch and Brake greatly speeds set-up and operation.

now you have

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more accurate work

better quality work

with these **HORIZONTAL and VERTICAL**

BROACHING MACHINES

BOTH EQUIPPED WITH

ELECTRO-MECHANICAL DRIVE

They represent the most advanced engineering
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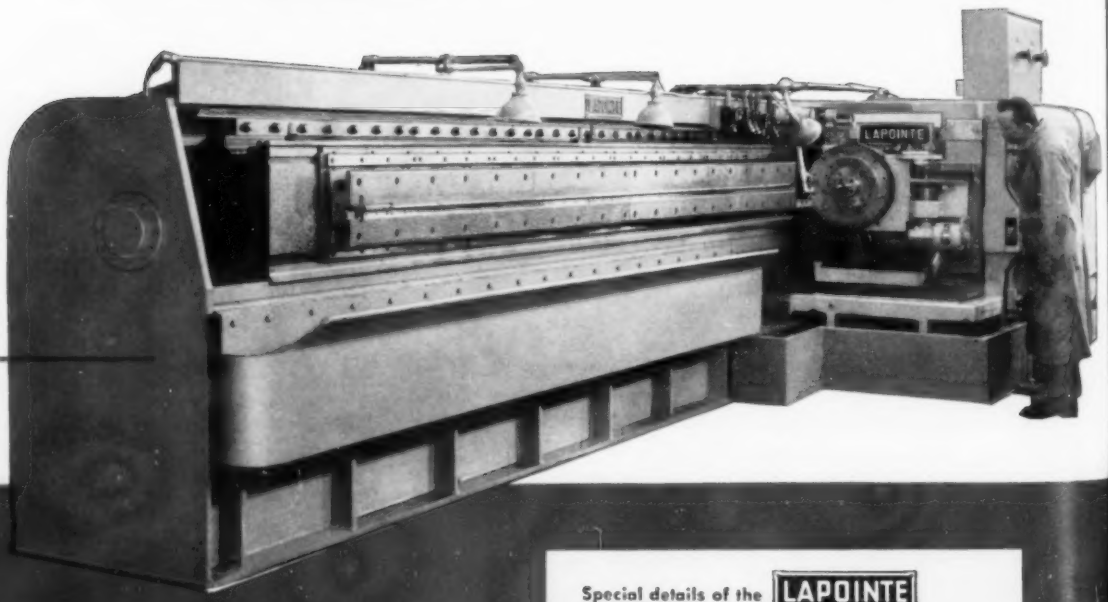

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Electric Drive
BROACHING MACHINE

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HORIZONTAL BROACHING MACHINE
Optional: Dual Speed and Dual Cycle (Patented).
Two slide widths, 16" and 24".
Strokes up to 180".

Here are the outstanding features of *both* machines, horizontal and vertical:

1. Broaching speeds up to 300 feet-per-minute, *and more.*
2. Amazing smoothness of operation at high speeds.
3. Electro-mechanical drive.
4. Exceptionally heavy, rigid construction minimizes chatter and *increases tool life as much as 2 to 5 times!*
5. Variable speed at your fingertips.
6. Main driving gear is continuous-tooth herringbone type.
7. Massive main slide rides on natural phenolic ways.
8. Saves down-time caused by excessive tool change-overs.
9. Easy to load and unload.
10. Unusual versatility and flexibility.
11. Simplicity of maintenance.

Bulletins are available describing both these machines. Ask for "Electric Drive Bulletins No. 5".

...s up to 300 fpm and more!

Yes, they're really fast! *What's more, these electric-drive machines give you a smoothness of operation never before attained in broaching. The natural result is more accurate, better quality work.*

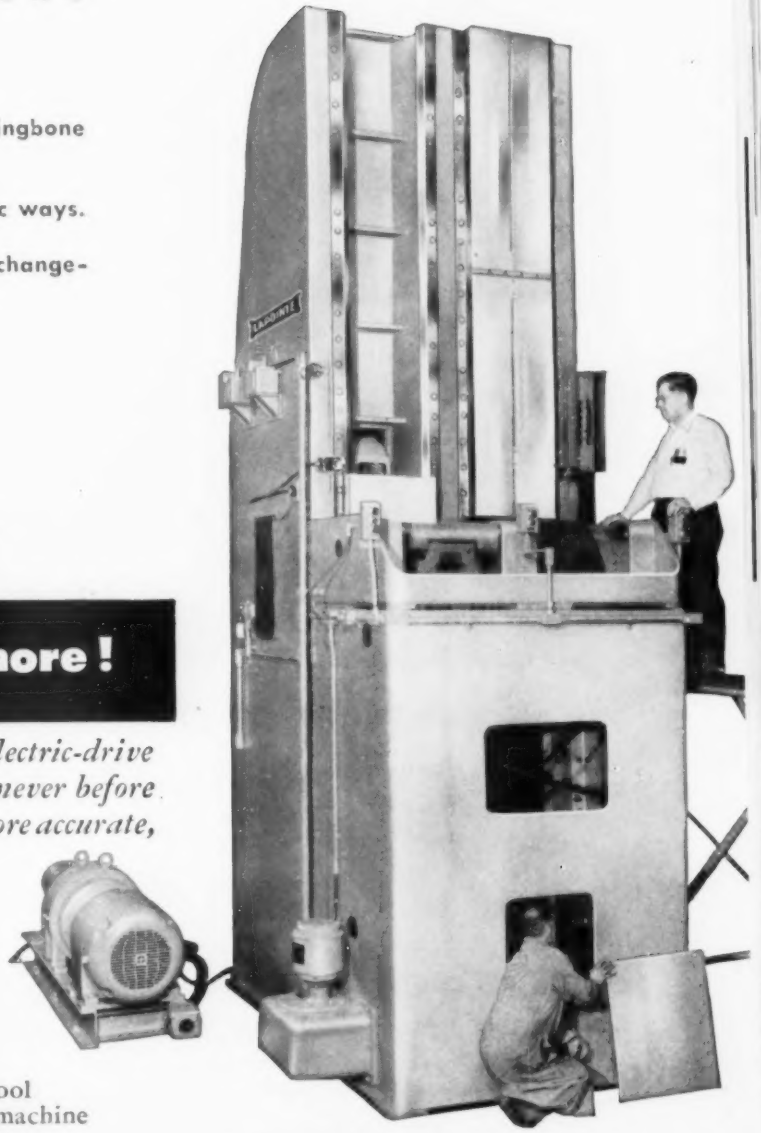
Here's a thought: Don't judge a machine by **rated capacity** alone . . . judge it by its **output!**

A machine may be **rated** at so-many-parts per hour but what is its actual output per shift?

In other words, how much does **down-time** affect your total production?

That's where **tool life** comes in! By increasing your tool life as much as **200% to 500% between grinds** your machine is actually giving you **many more productive** hours by **saving the difference in down-time** represented by tool changeovers.

(Photo taken during assembly)
Completely new LAPOINTE
Double Ram Vertical
Electric Drive
BROACHING MACHINE



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Double ram for high production. Slides are unusually heavy. Strokes available from 66" to 108".

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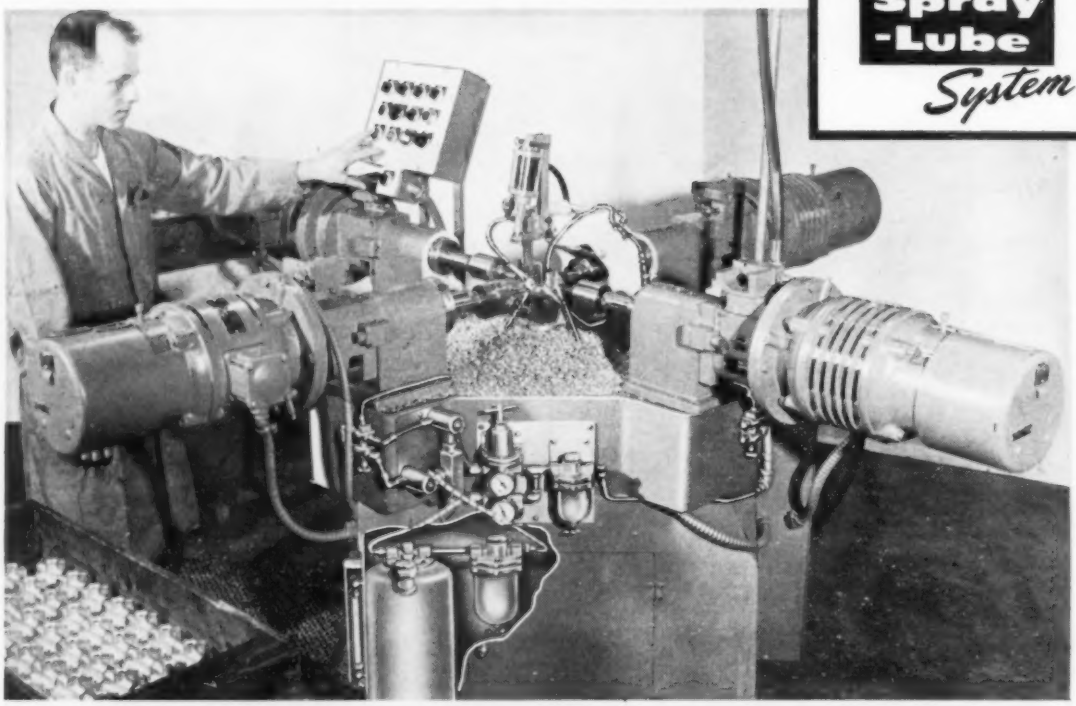
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

NOW a quick, low-cost way to "tool-up" for bigger production

NEW *Norgren* **Spray -Lube** *System*



gives more efficient application of cutting oils for

- ***higher cutting speeds***
- ***faster rate of feed***
- ***longer tool life***
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on tapping machines, drill presses, milling machines, grinders, lathes, boring machines, high-speed saws, stamping presses, die presses.

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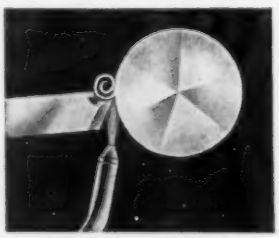
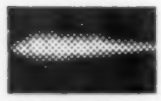


Coolant where you need it... spray is applied to work area from any required direction to thoroughly lubricate critical areas of contact between cutting tool and work piece.

A Drop of Coolant



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Fine spray rapidly dissipates heat... the spray lubricates tool more efficiently; has greater exposed oil surface area for fast, thorough dissipation of heat.

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- lower cost because of increased production and lower maintenance.
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- an extra strong weld—because it's 100% uniform and continuous.
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Whether it's welding, heat-treating, brazing, melting or heating for forging operations, it pays you to investigate TOCCO Induction Heating as a means to better products, faster and at lower cost.

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The Tool Engineer

To the Nicest People on Earth!

We salute the exhibitors cooperating in our Tenth Biennial Industrial Exposition to be held in Philadelphia from April 26 to 30. Without them, this show could not be a reality. Neither could it be the largest exposition in the history of the Society. Past performances have justified the confidence of our exhibitors. They have responded to make this show the most outstanding of its kind to be held in this country. With almost 500 exhibitors, our only regret is that we could not provide for everyone who made application for space.

The Society is happy to supply the medium for making this educational exhibit possible. It is a practical way to show tool engineers the various new methods for producing things. The engineer can study each process relating to his production problems to determine if he can cut costs in his own manufacturing.

Exhibits will be staffed by the top engineering personnel of each company. These engineers can discuss individual production problems and can demontsrate the potentialities of new equipment. In one day at the show, it will be possible to gather more pertinent information than could possibly be gathered in months of diligent search.

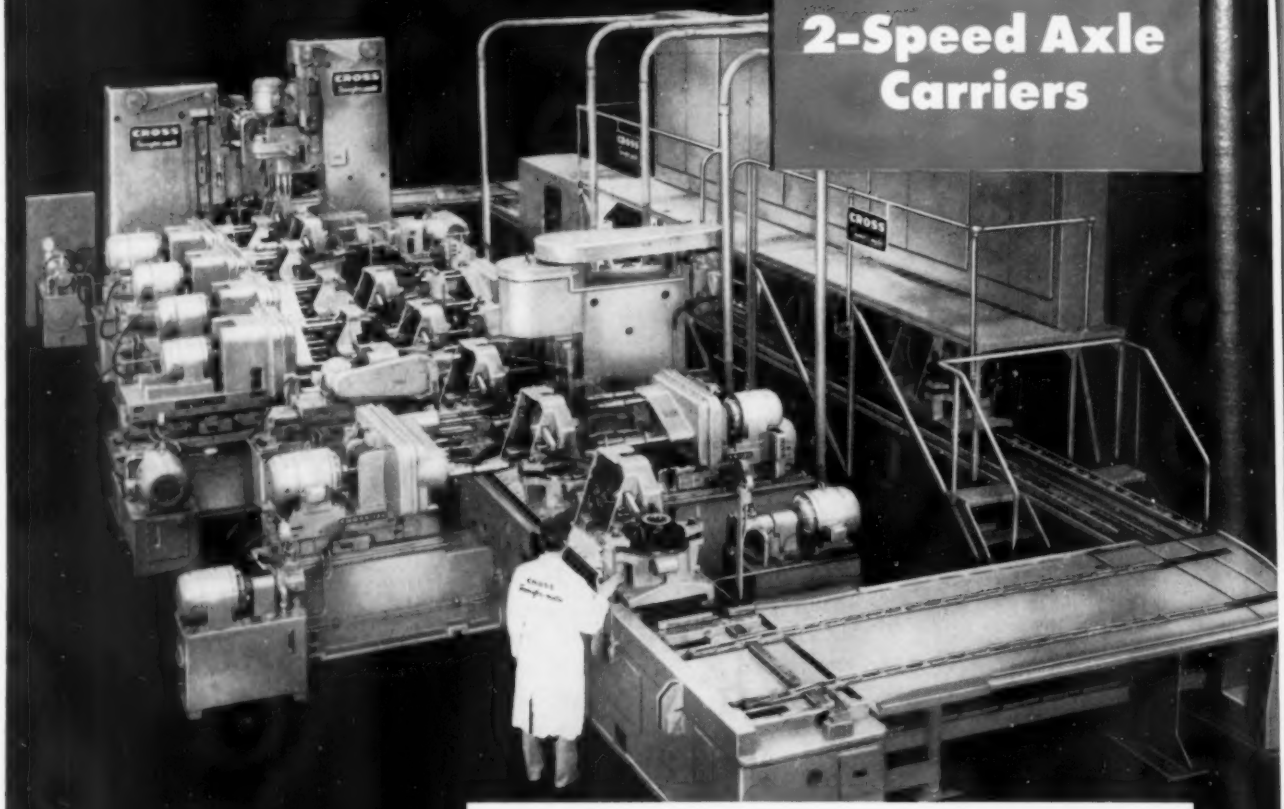
Here is a case of the buyer going to the seller, maintaining the tradition of the "old market place." This engineering exposition will bring the suppliers and tool engineers together, both having sufficient time for thorough discussion. In addition to sales for the suppliers, this meeting will result in improved production at lower cost, the responsibility of the tool engineer.

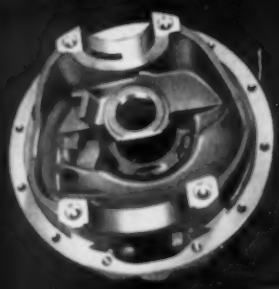
R. F. Waindle

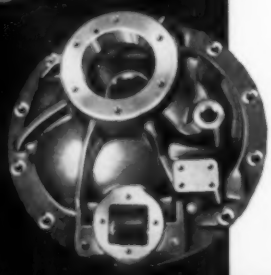
PRESIDENT
1953-1954

Another Transfer-matic by Cross

Mills, Drills and Taps Eaton 2-Speed Axle Carriers







★ 53 parts per hour at 100% efficiency—capacity for spiral bevel or hypoid style carriers.

★ 97 operations: 60 drilling, chamfering and reaming; 5 milling; 4 spotfacing and counterboring; 28 tapping.

★ 9 stations: 1 loading, 1 unloading, 7 machining.

★ Two-position, progressive type work holding fixtures with automatic transfer from station to station and integral conveyor for automatic return from unloading to loading station.

★ Cleaning unit for removing chips from fixtures between unloading and loading station.

★ Other features: Complete interchangeability of all standard and special parts for easy maintenance; construction to J.I.C. standards; hardened and ground ways; hydraulic feed and rapid traverse; individual lead screw feed for tapping; coolant system; automatic lubrication.

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THE CROSS CO.

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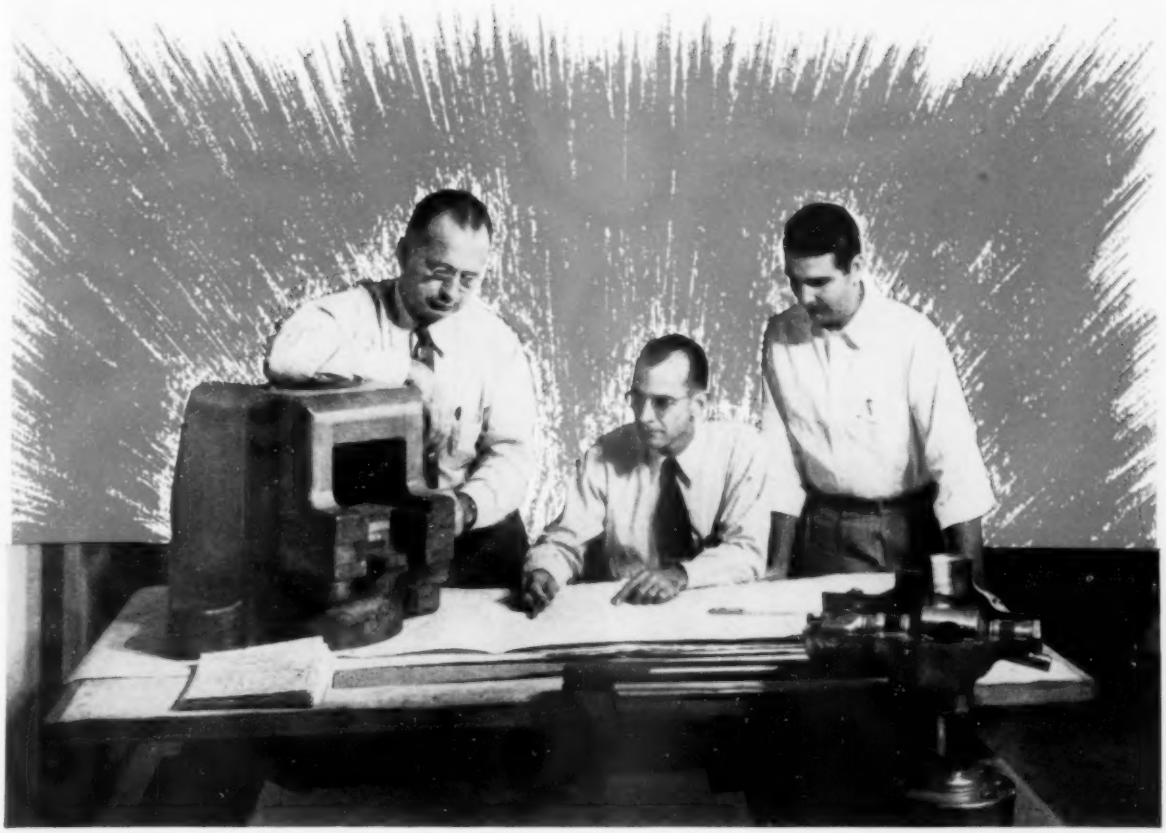


—Photo courtesy Cameron Iron Works

Fig. 1. Participating in refinement of product design is one of the many functions of tool engineering as the authority on planning and equipping processes required for manufacturing industrial products.

THE TOOL ENGINEER

. . . today and tomorrow

By Ralph H. Eshelman

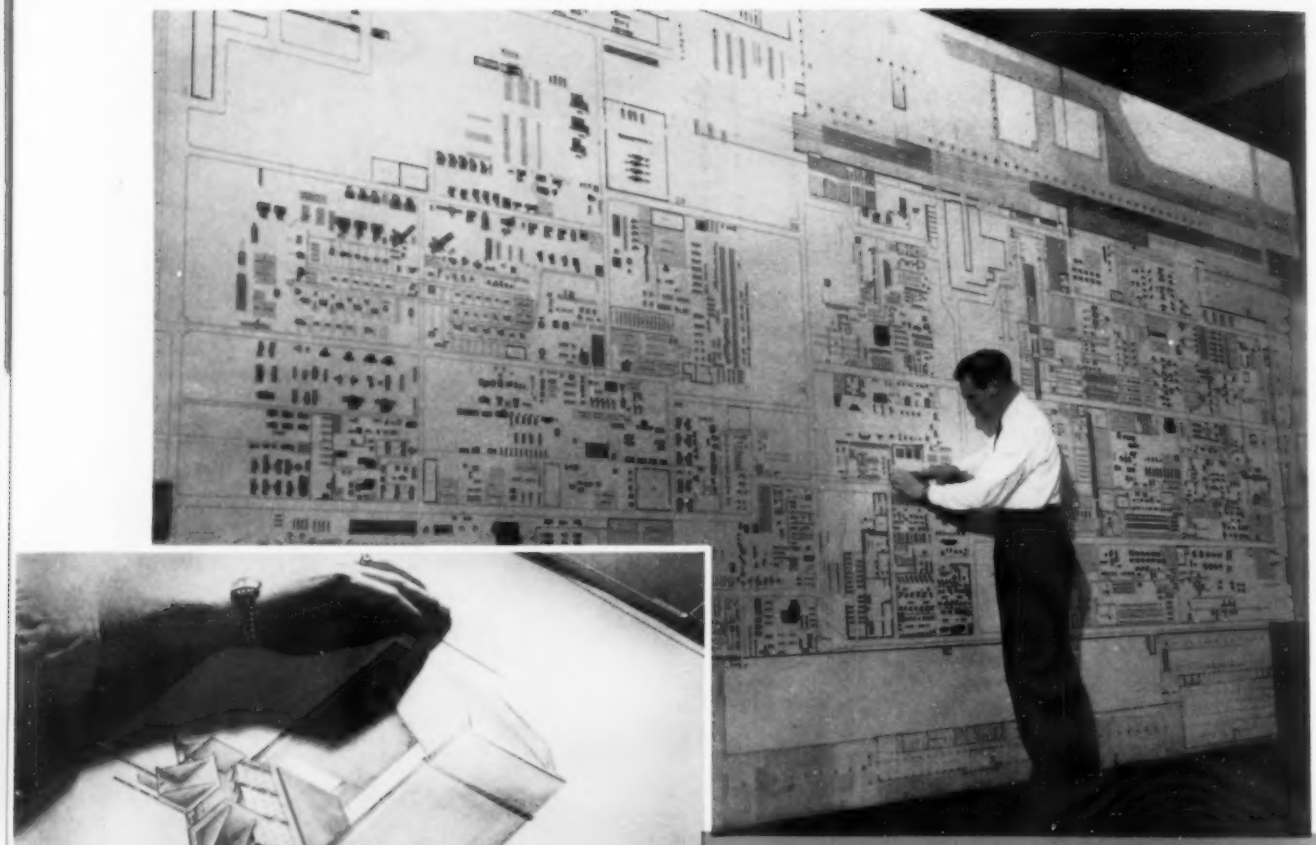
Associate Editor

THE TOOL ENGINEER is a man of broad responsibilities in industry—the cornerstone of the mass production system that is the foundation of the American way of life. He is the individual, *Fig.* 1, who contrives the economical means of manufacturing any product, taking into consideration quantities to be produced. In this sense, of course, he is a composite figure for rarely will one person perform all the functions implied.

The reply to a recent questionnaire, however, typifies the present status of the occupation in a large manufacturing organization. It read: "A tool engineer's work at Carrier Corp. goes something like this—a bundle of blueprints is dumped on his desk. First, he lists all the tools of production to be used and gets bids on them from several suppliers. After ordering, he sees that the tools arrive in time for production and that they work. Often 'bugs' must be worked out. He then prepares a process sheet showing all the manufacturing sequences and time limits. From then on he is constantly on the lookout for better ways and better products to do the job."

Pioneer of Improvement

From this picture it is evident that the tool engineer must be man of broad vision and creative ability. He must be able to invent new machines, *Fig.* 2, and devise new and better methods and processes to produce the multitude of new or improved products that emerge in a continuous stream from sales conferences and designing boards. In this he must be ever conscious of basic facts of



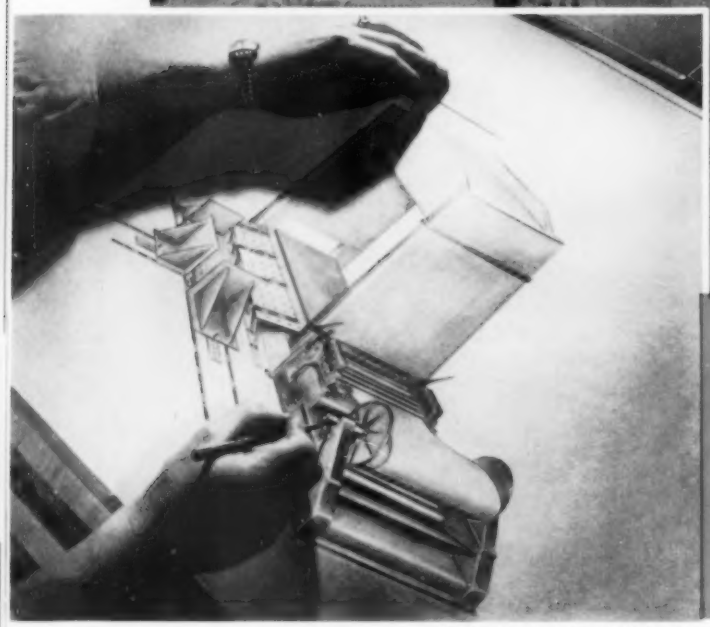


Fig. 2. (left) Conceiving a new device, such as this automation equipment, for development by machine designers requires a high order of ingenuity in the tool engineer.

Fig. 3. (above) Design for greater production is the purpose of this production planning board at Westinghouse Electric's Buffalo plant. With this, tool engineers have a bird's-eye view of every machine, production line, conveyor and crane in the plant.

—Photo courtesy Ford Motor Co.

competition and price. In this search for better and more economical ways of doing a job, the tool engineer is industry's cost cutter. He is the key to greater production and lower unit costs, *Fig.* 3, which have resulted in cheaper products that can be bought by more people. As such, he has contributed largely to the American standard of living. How closely industrial production and standard of living are related is clearly depicted in a chart comparing output of electric power and value per capita of all products, *Fig.* 4. In effect, this charts the great rise in productivity per worker made possible through more and better tools and better processes.

This role of pioneer of manufacturing improvements since the days of Eli Whitney, demands of the tool engineer initiative, and integrity in addition to technical ability. Because of the nature of his work, A. M. Sargent, past president of ASTE, points out, the tool engineer finds himself something of a middleman between labor and management. He works with men who operate the machines of production as well as with men who are planners, administrators and policy makers. In this position he has to do a selling job with both. He must demonstrate to management the values of mechanization. He has to prove that the cost of installing better and more efficient machines and tools will be justified by lower costs and increased production.

Selling Job

On the other hand, he finds it necessary to persuade working men as individuals and union members, that increased mechanization will benefit them also through greater employment, shorter working hours and higher wages. Already progress has been made in this direction. The agreement between General Motors and the union provides for an an-

nual improvement factor that "recognizes that a continuing improvement in the standard of living of employees depends upon technological progress, better tools, methods, processes and equipment, and a cooperative attitude on the part of all parties in such progress. It further recognizes the principle that to produce more with the same amount of human effort is a sound, economic and social objective."

New Concepts Needed

In the modern sense the concept of the tools of production is very broad indeed. It may include a milling cutter, a turret lathe, a line of stamping presses, transfer equipment, *Fig.* 5, or an entire factory. Tool engineering has changed correspondingly.

In the past and lingering in some quarters even today, the view of the profession has been limited by a narrow idea of tools. The tool engineer was considered a designer of ideas, jigs and fixtures. He was thought of as essentially a practical man with the master mechanic, a sort of super troubleshooter in the shop, tops in the field. This may account in part for the wide variety of titles that have come into current vogue, as the field has expanded tremendously under the impetus of wartime, postwar boom, and defense production. The larger the plant, the more the duties are likely to be subdivided. Today in some of the top corporations it is difficult to find anyone with the exact title of tool engineer. For example, at Ford Motor Co., the function is found under manufacturing engineering with experts in processes, tool designing, automation and the like grouped together. Western Electric prefers the term production engineering, as do numerous other firms.

A master mechanic who can answer any question is no longer the symbol of the profession due to specialization required by increasingly complicated and exacting processes and methods. While a man may be performing the function of a tool engineer under any of these descriptive titles in a big organization, in many smaller organizations he may actually be a tool engineer and carry such a title as superintendent, works manager, plant manager, or factory manager. Indeed, he might still be a tool engineer even though he is the president of the company, if he constructively originates the processes or equipment for performing manufacturing operations.

As concepts of tooling have matured, the area of responsibilities of the tool engineer has similarly been enlarged. In one large manufacturing organization they have been catalogued as follows:

1. Preparation of preliminary cost estimates
2. Assistance to designers in product development
3. Continued liaison with designers through the final production design
4. Interpretation and transmission of design information to all manufacturing activities
5. Control of purchased material specifications
6. Specifying processes (detailed steps by which the product is to be made)
7. Development of new processes and methods when required
8. Determination of time and amount of facilities necessary
9. Design and provision of facilities

—Data courtesy Vitro Corp. of America

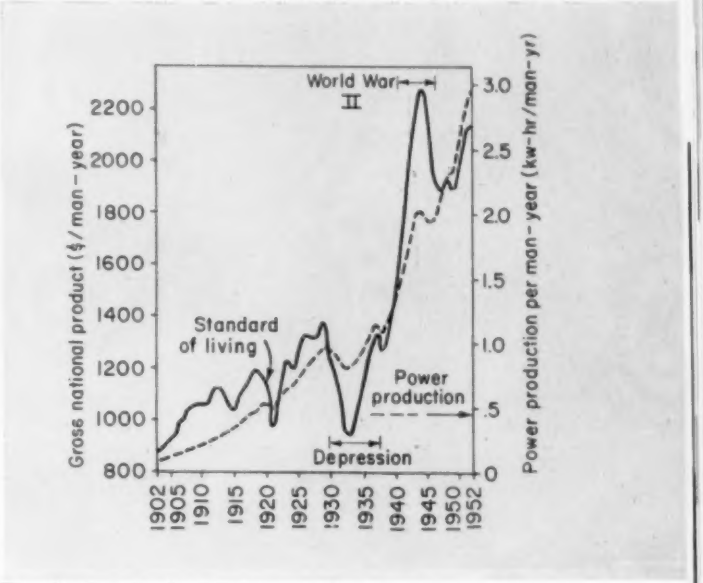


Fig. 4. Standard of living vs. electric power production in this country.

10. Development and designation of inspection methods
11. Rating production jobs for personnel skills required
12. Technical assistance in tooling and manufacturing difficulties
13. Final cost estimates for new products
14. Continuing cost reduction through suggested design changes, better facilities, processes and labor utilization

This list indicates the extent to which tool engineering has been revolutionized in the last fifteen years. The tool engineer fills a much larger spot in the organizational picture. Management is inclined to consult him at an early stage of product development to see how manufacturing costs can be minimized. He has a finger in design from the beginning to see that it's drawn up for producibility. It has become an accepted function of his job in most industries to determine that the product will be tailored to fit the tooling program. His recommendations for revision of product design carry real weight because of the size of tooling appropriations. This was publicly demonstrated in a recent report in *Life* on the birth of the '54 Buick. According to an anecdote related here the designers wanted some intricate chrome moldings. But they were turned down flatly by the division's general

Fig. 5. At the Cleveland engine plant, Ford Motor Co., over 500 operations drill, tap, mill, bore, broach, and hone engine block castings automatically in this continuous line.

manufacturing manager strictly on basis of production costs. The article further indicates that production considerations are weighted most heavily in the final analysis of design.

Increases in tooling costs have stemmed from a number of factors including the growing complexity of products themselves; everything from toasters to airplanes are becoming more complicated and automatic, requiring more extensive tooling as well as engineering. For example, in the aircraft industry it requires 27 times more engineering hours to produce a typical jet fighter such as the F 86 Saber than for the P 51 Mustang, its World War II predecessor.

In the automobile industry in 1934 a typical appropriation for tooling was about $2,000,000 and the cost for designing a model was $4,000,000. Obviously, at that time the product engineer was of greater economic importance than the tool engineer; in that day the tool engineer largely fit available tooling to the product. He had to adjust production methods to the design which was handed him. Today the situation is reversed; cost of tooling a medium-priced car runs to $12,000,000, whereas the costs for designing it are far less. So, proportionately, he has assumed much greater importance in the industrial picture.

Again, increased mechanization and automation, *Fig.* 5, have boosted cost of equipment and amount of tooling appropriations. At Ford Motor Co., between the years 1946 and 1954 a billion dollars were spent in automatizing operations and expanding production facilities. A complete stamping plant with nineteen major press lines was built for mechanized operation. Servomechanisms, electronic controls, and tape operated mechanical brains, promise accelerated progress in the future.

Tool Engineer's Role in Automation

As more and more processes and even whole production lines are automated, the function of the tool engineer will rise to even greater importance on the industrial scene as the central figure in these developments. The complex new industrial machine will be able to function in proportion to the ability of the tool engineer to measure up to the challenge and responsibilities that are being thrust upon him.

In this picture it will be essential that a product be designed to fit the automatic processes of production rather than vice versa, according to C. F. Hautau of Hautau Engineering Co., automation engineers. He sees further reduction of the human element in manufacturing as the principal means

open to hold down costs of manufacturing or reduce them further. Carbides, speeds, size of machine tools and other elements that enter into product price have been thoroughly explored to the point of diminishing return. With the cost of labor constantly rising, the only avenue for reduction of costs to support the constantly rising standard of living will be further reduction of manual handling. This will permit elimination of inventories between processes and machines. In other words, the product will be manufactured in one complete sequence from beginning to end. The stack of parts now required beside each machine will be eliminated, cutting costs because of reduced space and handling.

To be ready for these changes, the tool engineer will have to train himself to look to the future. Creative ability and alertness to change will count heavily. Tool engineers will tend to become more executive and cost-minded. Management, when it analyzes appropriations and dollar costs, will inevitably recognize that the tool engineer and his staff are a vital element in maintaining the company's competitive position in the future.

Rodger S. Emmert who has risen from production engineering ranks to management in General Motors Corp., feels that as the field becomes more technical, a higher order of engineering and more information of the physical arts such as physics, chemistry, metallurgy, electronics, etc., will be required. This, in turn, will call for specialists, men who are experts in one particular phase with great technical knowledge and skill and, as the organization becomes more complex, likewise one of the requirements will be the ability to work with each other and cooperate with other departments such as the product design department. Probably as much stress will be placed on cooperative ability in the future as upon technical ability in itself.

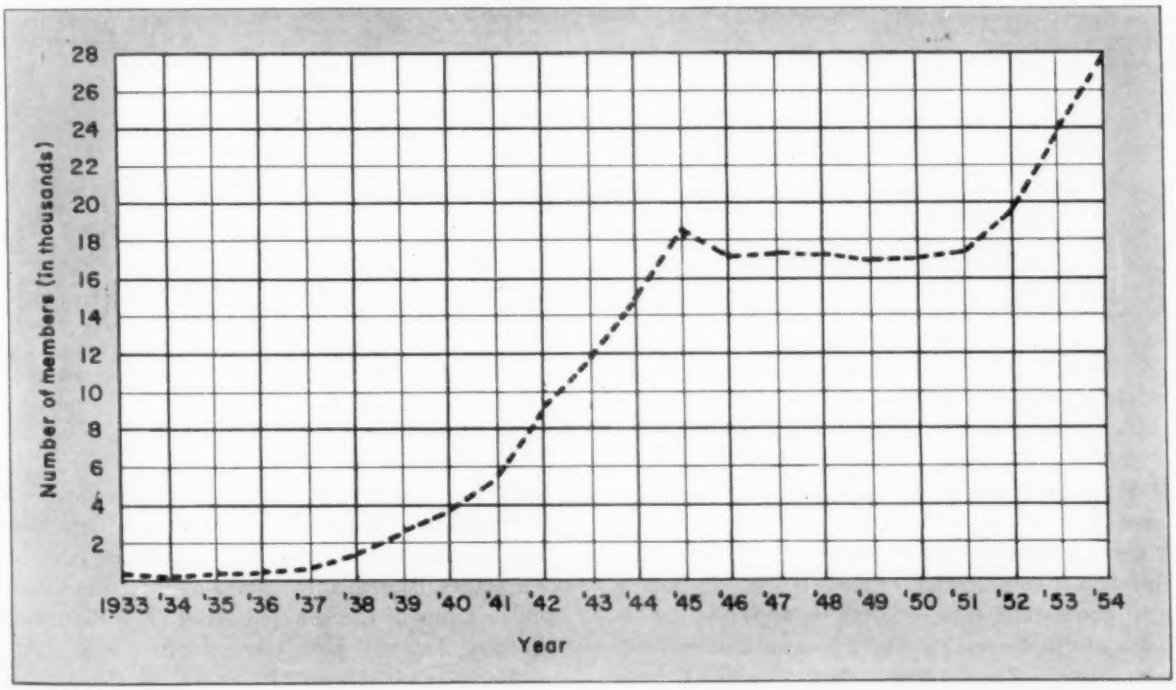
Ability and Professional Status

Other evidence corroborates the growing prestige and influence of tool engineering. From a numerical standpoint, membership in the American Society of Tool Engineers is a fair index of expansion of the field as well as growth of professional consciousness, *Fig.* 6.

In a recent survey, security, opportunity for advancement and recognition are cited as the primary goals of the engineer in his job. Tool engineers, like other engineers questioned in this survey, appear to be uncertain whether they have achieved those goals or are achieving them. Scanning current topics in popular periodicals reveals that, on the contrary, engineers have been much in the public consciousness of late, principally because of widely publicized shortages in their ranks. These have been variously estimated at from 35,000 to 100,000 as of the present date with a general upward trend. According to these and other indications, it appears that, despite the feeling of many engineers, the public recognizes and respects engineers and the contributions that they have made in technological progress.

Among various classifications of engineers the production or tool engineer ranks well, as indicated by a survey of income by the National So-,

Fig. 6. Growth of membership in American Society of Tool Engineers from beginning to present.



ciety of Professional Engineers, TABLE 1. This survey indicates that production engineers stand roughly parallel with their counterparts in design, though somewhat below research and development, sales engineers and executive-administrative engineers. This study also indicates that the engineer can look forward to a steadily rising income and improved position based on experience.

While it is well-known that many engineers, including representative numbers of tool engineers, are now in management positions, it is probable that this trend of filling executive positions with engineers will become even more pronounced in the future. Representing a widely held school of thought, Dr. R. F. Pearse of the management consultant group, Worthington Associates, feels that in the future a large proportion of executives, especially in more complex manufacturing and chemical fields, must of necessity be scientists and engineers because of the pace of technological developments. Growing complexities of industry and technology will make it difficult, if not impossible, for nontechnical executives to function effectively. Already, many executive decisions are being made on a committee basis because of the necessity for technical consultation and other factors.

Tests of Worthington Associates, in numerous case histories, seem to indicate that widely discussed deficiencies of engineers can be compensated to a considerable extent. While recognizing his personality type without trying to alter it basically, the engineer can overcome some of his weaknesses. These, it has been suggested from numerous studies, can be largely overcome by active participation in professional societies, in community affairs and by teaching or lecturing on engineering subjects, delivering technical papers or writing for technical publications.

Weak spots in the engineering curriculum are already under study in many instances and changes are under way. Since the engineering student is result-minded, he shuns nontechnical subjects such as social studies, economics and English. Some engineering schools are striving to revise his attitude by stressing the practical side of these subjects. For instance, courses in report writing may eventually lead to competence in expression in both written and other forms of communication.

In one instance, a large steel company decided to bring enconomics home to their production men in a practical way as a means of securing cooperation in reducing manufacturing costs. The course was couched in everyday production terms, discussing elements of manufacture familiar to all participants. As an aftermath, the course was adopted in the local schools, being recognized as an outstanding contribution to the subject of economics.

Obviously not all tool engineers desire to become executives and administrators, preferring to specialize or serve in research and development. nevertheless, evaluating their assets and liabilities, tool engineers can face the future confidently. When they become fully aware of their potentialities in terms of the new industrial revolution now shaping, they will have taken the first long stride on the pathway that can open up horizons unlimited.

Table 1—Median Income According to Type of Engineering Work and Year of Entry into the Profession

Years of Experience	Executive Admin.	Sales	Teaching	Design	Production	Research & Develop.	Construction Supervision	Other
2	5050		4900	4730	4600	4310	4580	4290
4	5580	5250		5170	5280	5330	5080	5110
6	6750	6880	5820	5990	6250	5790	6050	5500
10	8110	7100		6860	7250	6690	6670	6170
15	8930	8140	6920	7560	7460	7790	6830	6570
20	10070	9360	7100	7640	8500	8210	7200	7330
25	9650	9640	8000	7770	8500	9250	6720	7180
30	10470	10690	7420	7960	8130	8600	6930	7460
35	11200	9750	7940	7990	8630	8080	7410	7310
40	11260	11400		8110	9750	7970	7210	7810

Based on National Society of Professional Engineers Data

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Universal Depth Gage

A small job shop received an order for a variety of parts in quantities of 100 and less. Depth of bores and shoulder lengths of parts had to be held to plus or minus 0.001 inch. As machine operators were inexperienced in use of depth micrometers, depth gages were desirable.

Gages were required so numerous as to constitute a cost problem. This was overcome by developing the simple device shown in the accompanying sketch. Widely adaptable, this universal depth gage was built at a cost of only $45.00 with the following pieces:

(1) Body ¾ by ⅝ by 6 inches long. Tool steel, hardened and ground with four holes ½-inch diameter to reduce weight. Four cutouts to receive fingers. Size, number and location of cutouts can be varied as desired.

(2) Fingers ⅜ by 3/16 by 2¾ inches long. Tool steel HD GR. Length varied according to requirements of job.

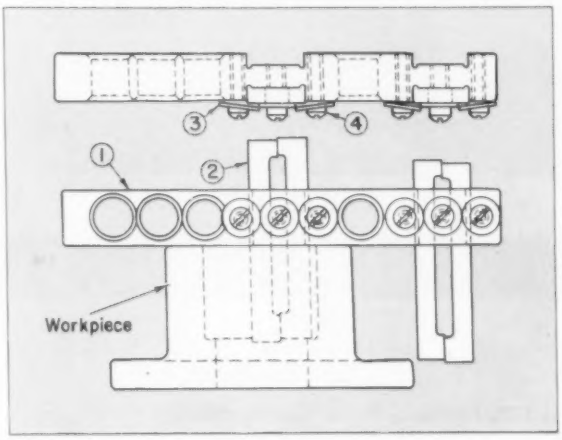
(3) Washers ½ by 1/16 with 13/64-inch diameter hole.

(4) Screw 3/16-inch diameter.

The two fingers are set at different depths for Go and Not Go. The sketch shows gage in Go position on workpiece. By sliding gage to extreme left the lower finger will hit edge, indicating Not Go.

An easy way of setting fingers to proper depth is to place gage on parallels set on surface plate with gaging end of fingers pointing up. Jo block or size block is set on body near finger with aid of indicator mounted on surface gage and fingers are adjusted to required setting. If Jo blocks are unavailable a vernier height gage with indicator attached will do the trick.

Frank P. Colline
Philadelphia Chapter



Broaches Converted from Scrap Reamers

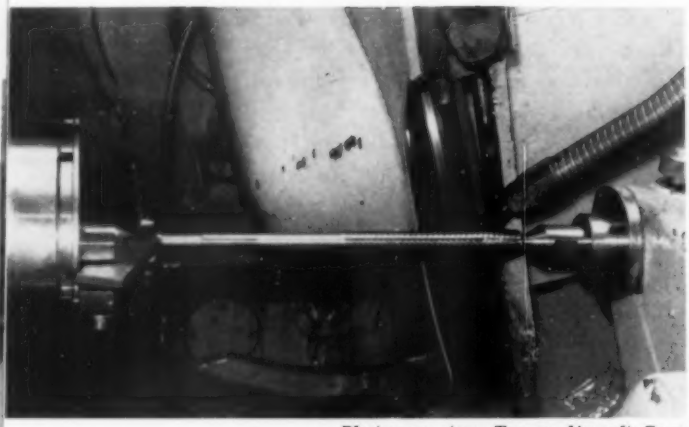
To eliminate tooling delays caused by several weeks or even months waiting for broaches to be custom made to production specifications, a method was devised to make them with available stock and equipment.

The original suggestion was to make them with spiral threads instead of conventional circular type. In this way they could be produced in the machine shop on standard thread grinders. This plan was modified to embody further suggestion that castoff reamers be used for stock, reducing cost of the tools even further.

Only two major steps are required in the conversion of scrap reamer to broach, illustrated in the top photo.

The reamer is first ground to desired broach size on a cylindrical grinder. Reamer diameter must be sufficiently larger than the desired broach to allow for grinding. For example, a ⅞-inch or ¾-inch reamer is chosen to remake into a ½-inch broach. The reamer shank is also formed to fit the adapter on a broaching machine on the cylindrical grinder.

The second step is thread grinding shown in bottom photo. Four leads or spirals are used with a pitch of two threads per inch. Each lead has a 45-degree secondary land to provide shaving clearance.



—*Photos courtesy Temco Aircraft Corp.*

and a 7-degree primary land, which is the cutting edge. Leads are similar to a Buttress thread used on firearms where pressure (recoil) comes from only one direction, since broach pulling action likewise exerts pressure in only one direction.

The tool is ground to a 0.001-per-inch taper except for the last inch of its length. This is left untapered to give the finished broach its burnishing action, which in turn imparts a mirror finish to sides of the hole. Tapering is done on the thread grinder.

Doubt was cast at first on use of spiral broaches as some felt the tools would twist when pulled on the 50 hp broaching machines. No twisting occurs, however, and the spiral cutting edge affords a desirable shearing effect.

The transformation requires just four hours. Broaches have been fabricated in sizes from 3/8-inch to 1¼ inch. All have proved highly satisfactory.

P. F. Young
Hiram W. Nowell
Dallas, Texas

Paraffine Drill Lubricant

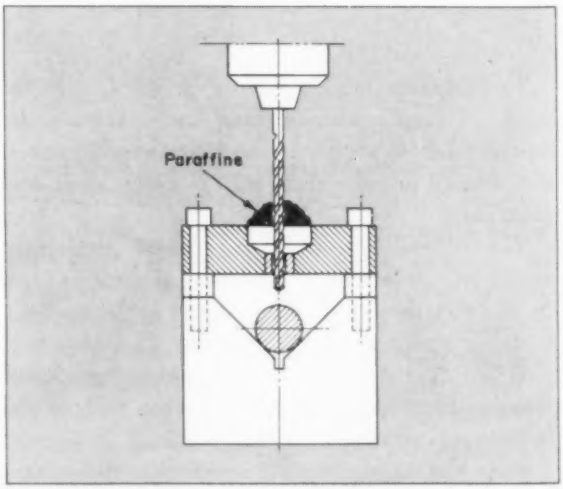
Small hole drilling with a drill press not equipped with a cutting oil system can be speeded and drill life increased by the application of paraffine. The accompanying sketch shows a manner in which it can be used on a setup for drilling small cotter-pin holes.

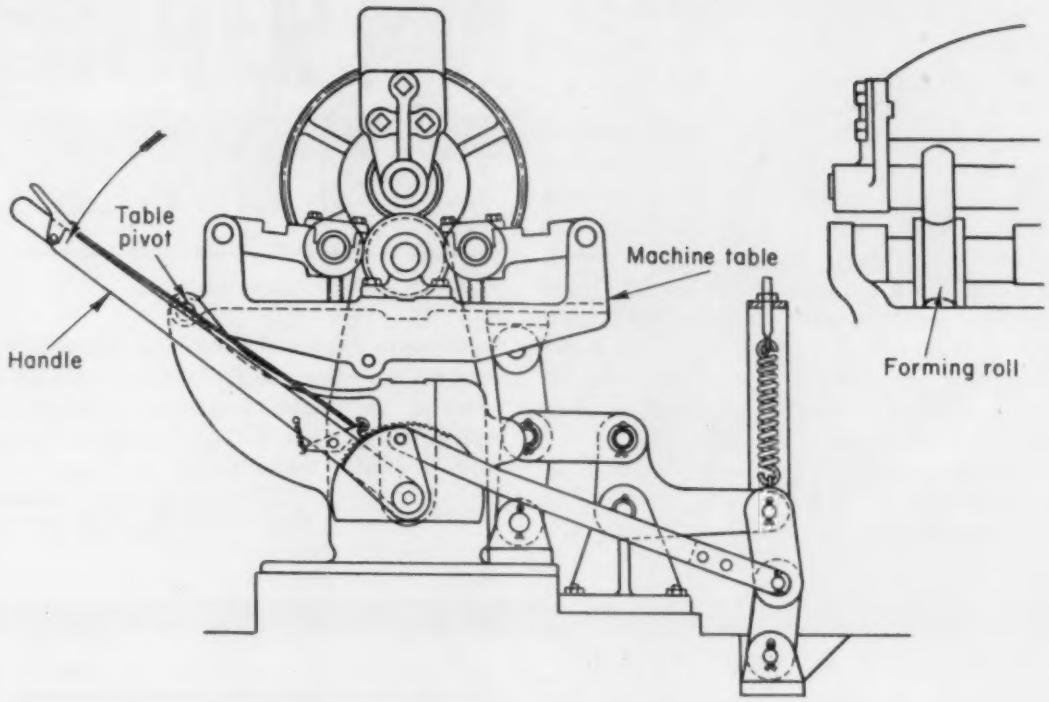
The plate has a hardened drill bushing pressed in place as illustrated. The counterbore above the bushing is made large enough to contain a sizable wad of paraffine, a portion of which can be allowed to protrude above the bushing plate. In operation, best results are obtained by retracting the drill point into the paraffine after each hole has been drilled. The heat built up in the drill will tend to melt a small portion of the paraffine, thus giving a film of lubrication to the drill. With every few pieces, the operator should gently pack down the paraffine.

The bushing plate, which can be secured to the vee block with cap screws, should be elevated above the workpiece sufficiently to allow chips to be removed before entering bushing and paraffine.

This method of lubricating approximates the cutting oil in squirt can method, except that it eliminates all possibilities of giving the operator an unwanted oil bath.

W. H. Saling
ASTE North Texas Chapter





Toggle Action Mechanism

Steps up Rolling Machine Capacity

To manufacture rims for farm implement wheels ¼-inch thick by 2½-inches wide from flat iron strips required a bending and squeezing action of about 12 tons. Only a small machine capable of exerting about 4 tons' pressure was available.

The problem was solved by designing a combination of toggles and links to increase the pressure exerted on the flat strips. The mechanism is shown in the accompanying illustration. The operating handle pivots on a pin driven into the machine frame. A link connects the handle with the compound toggle mechanism composed of two toggle linkages connected by a bellcrank. The lower links in the toggle mechanism are pivoted in brackets bolted to the machine base. The upper toggle link is pinned to the machine table. This table pivots on a bracket fixed to the machine frame. A coil spring in the mechanism serves to give a smooth movement. The actual forming rolls are shown in the enlarged section.

The machine operator applies only about twenty pounds on the handle to sesure the desired results. By adding this power multiplying device the additional pressure required for the job was easily secured. Adaptations can, of course, be used for many different jobs where equipment costs must be kept down.

Hjalmar Dahl
Upplands Vasby, Sweden

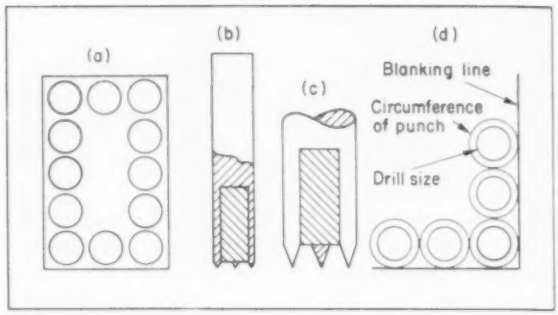
Special Marking Punch

In preparing blanking openings of dies the small shop toolmaker without special machine tools (jig borer, contour saw, etc.) will probably resort to the blacksmith method.

In this he drills a series of holes inside the blanking layout so that they neither reach the blank line nor each other, as shown at *a*. After having opened all the holes he takes out the central slug and finishes the hole by filing.

In such cases it is convenient to use a special center punch which can be made in several forms. A simple and easily produced design is shown at *b*, detail at *c*. It consists of a round closed tube made from hardened tool steel with a sharp edge (analagous to a standard dinking punch) and encloses a standard center punch.

The outside diameter of the punch should be a little greater than the drill used for opening the holes. In use, the punch is placed so that its circumference touches the blanking line at one point and the preceding punch circumference mark at another *d*. Only light blows must be struck on this special marking punch. The centers can be repassed with a regular center punch afterwards.



Federico Strasser
Santiago de Chile

Finding Die Gravity Center

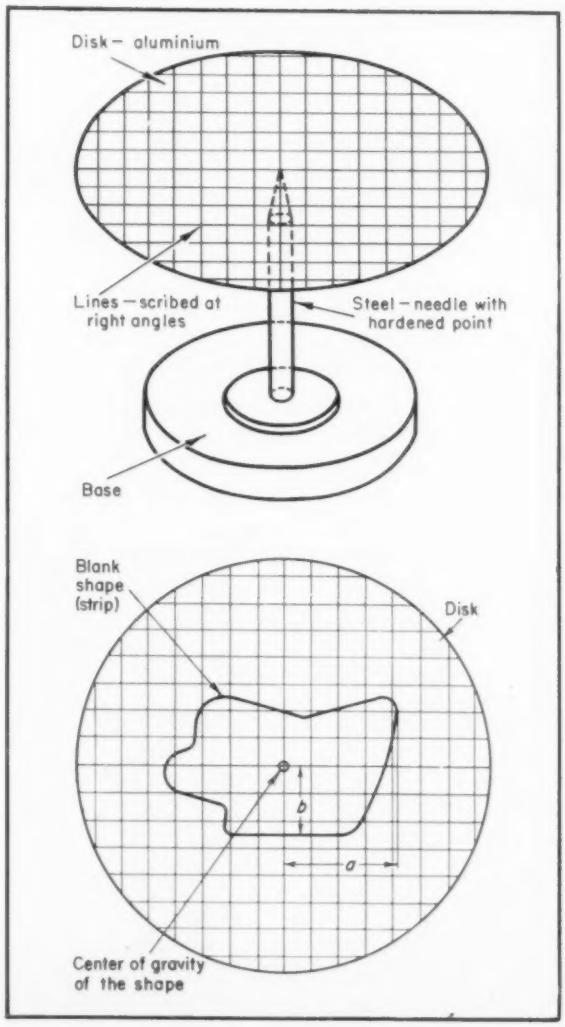
The accompanying sketches illustrate a single device for determining the center of gravity for a blanking, trimming or punching die to form blanks with complicated contours.

The device consists of a base, a steel needle and an aluminum disk. The steel needle is fastened in the disk, and has a hardened point on which the disk is balanced. The surface of the disk is divided into squares by a grid of lines. A thread or metal strip approximately 0.25 inch wide and with the same length as the circumference of the die is used. The thread or strip, made of soft metal is bent to exactly the same shape as the blank.

The formed detail should be positioned on the disk in such a way that the disk balances. The center of gravity is determined by measuring the position of the contour in ratio to the center lines of the disk as shown in sketch *B*.

By using this method it is possible to save the die-designer much trouble as the punch is correctly placed in relation to the shank. The center of gravity of a bent metal strip is identical with the pressure center of the blank as the load in a blanking die takes place along the contour of the punch or blank. Correct position of the punch on the die shoe is found when the pressure center of the punch coincides with the centerline of the shank. This insures symmetrical load on the press and die guides, thus giving longer life to the equipment.

Bjarne Loken
Oslo, Norway



WHITHER TOOLING?

By Robert A. Wason
Associate Editor

IT WOULD BE DIFFICULT to predict the individual steps by which production processes will evolve in the future but long-range trends already show where this evolution must lead. The marriage of genuinely automatic machines and electronic computers is going to result in pure automation. No longer tied to the need for producing and controlling by multiples of two eyes, two hands and ten fingers, those responsible for production and design will be in a position to plan with pure automation.

A machine is being developed that will read a blueprint and automatically transform raw materials into finished products; every unit produced will be within specifications. An automatic sardine packing factory has been designed to measure the length of each sardine by loran and pack them by length. A machine has been developed that will remember facts and will recall any specific one on instruction. Still other machines have been "trained" so that, for a given stimulus, a conditioned response will be made. A mechanical mouse has been developed that will solve a maze by trial-and-error, will remember the solution and exactly duplicate the correct moves regardless of where it is restarted in the maze, and will forget the solution if the configuration of the maze is changed. Business equipment has been developed whereby a clerk punching out a sales receipt for a customer will at the same time be advising a production facility in another geographical location of the need for a replacement of the product sold. New telephone equipment automatically places the call, times the connection, debits the account of the subscriber, totals the debits for a period of time and prepares the bill. There is no fancy among the previous examples. Such equipment actually exists or has been proved out in design.

These examples do not even mention the devices for war in which human beings are now designing themselves out of their own instruments of destruction. The human being, because of his limitations, his inaccuracies and his desire for less labor, is also being designed out of production processes. This change started in chemical processing, where the labor force per unit of production and per unit of capital investment has sharply dropped, and has progressed to nuclear production where processes could not have been successful if subject to human control.

Producers and users of semiautomatic machinery have long known that machines are influenced by their operators. In the manufacture of hosiery, for example, two operators alternately using the same

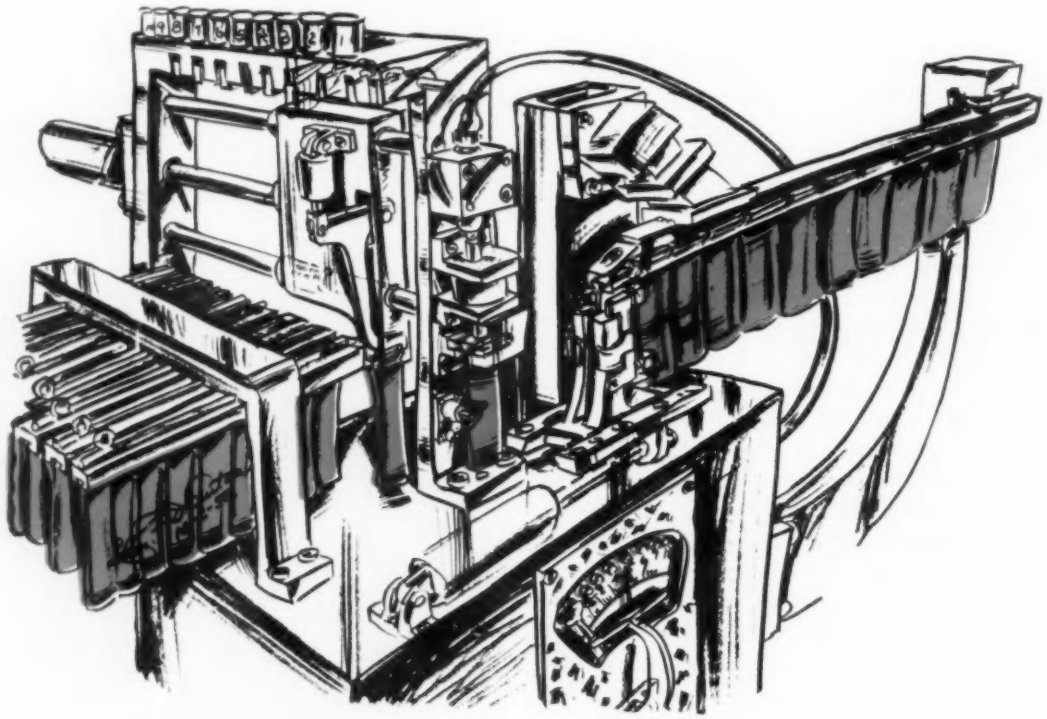
machine will produce a product with consistently different quality.

Automation is already here in various degrees. Products are produced automatically, machines are used for assembling other machines and the gaging function is moving out of its remote inspection department onto the production line. Communication of process information is being speeded and it is just a short step from communication to control.

Cybernetics is an imposing word that fundamentally means feeding back results of some process to control the results for the repetition of that process. Anything that can be measured can be automated and any measurement that can be indicated can be used to control production of that measurement. Grinding machines are now available with continuous gaging to automatically size parts.

The human element eventually will vanish from operation of the production line. Personnel for the factory of the future will be maintenance men, and planners of processes and tooling. If a complete process can be thought out in advance, with all variables and methods for controlling them predicted, a production program can be put on tape and made self-operating.

The processes of the immediate future are already in evidence. Those of the more distant future have not yet been revealed. However, production will always entail the shaping of materials and their assembly into the desired product. The potential of shell mold casting, with its inherent quality for automation, is just beginning to be realized. The fields of ultrasonics and electrical induction have only had their surfaces scratched. Cold working by extrusion, drawing and forging are all new enough to rate headlines. Controlled electrical disintegration of metals has not yet revealed any limitations. With the present restriction on the free flow of nuclear information, no one can guess the impact on production of such a concentrated energy source. Since all production centers around the application and direction of energy, it can be anticipated that amazing things will occur when this new force can be appraised and applied as a tool instead of a weapon.



The practicability of direct generation of electrical energy by fissionable materials has been demonstrated.

Special and general-purpose machines will encompass automatic features and design details to reduce the nonproductive portion of the work cycle. Giant planers, for example, now cut in both directions. New materials have gradually reduced the time for the metal removal part of the cycle. Mechanical, hydraulic, electric and combination drives will leapfrog each other, and will all be infinitely variable over the range of the machine. At any given time, one type may have major prominence, but development work on the others will allow them to pass the favorite. Mechanical, electrical, pneumatic, hydraulic and electronic control will follow a similar course.

As mechanisms and controls become more complex, maintenance features will have to be considered. Machines of the future, although having greater rigidity, will be much more exposed, simplifying work handling as well as maintenance. This

will not introduce safety hazards because there will be no operators at the machines while they are in operation.

The possibilities of higher material removal rates with current tools have by no means been fully explored. Future machines, being more rigid, will be able to maintain optimum speeds and feeds within the limits of the tools. Rate of metal removal increased drastically with the introduction of carbides, and there is no reason to believe that these tools represent the hardness limit of synthetic materials. New coolants and lubricants, and new methods of applying these materials will further speed removal of material. Preheating the workpiece, jet cooling the tool and a deeper insight into the mechanism of cutting are further increasing metal removal rates.

One current machine uses ten times as much power as the machine it replaced but removes the equivalent amount of material in one fifteenth the amount of time. It is based on a simple truth: if one tool requires 15 units of time, 15 tools in a gang require more power but only one unit of time.

Masters Will Be Copied

Most general-purpose machine tools will include some form of copying device as standard equipment or special attachment. Automatic positioning will be accomplished with electrical control of hydraulic or pneumatic clamps. Loading and unloading will be automatic even for short runs. Machines will be so controlled and clutched that starting and stopping of the workpiece will be extremely rapid; probably the drive will be continuous with just the workpiece and its chuck starting and stopping. Fluid magnetic clutches already make this feasible.

Setup and preselection positioning devices will be used with standard families of fixtures that will evolve. Once a workpiece is mounted on or in a fixture, it will remain in the same fixture from machine-to-machine and from process-to-process.

Setup of presses is already being aided by electronic recording equipment and it will not be long before setup is accomplished by computer controlled units. Instead of indicating what should be done, the electronic device will cause it to be done. Instrumentation with the sole function of indication will be obsolete. High-speed photography, associated with instantaneous film development, and television may become set-up tools during the intermediate period before complete automation.

Tooling for machine tools is due for some drastic changes too. There has been a quick evolution to the rapid changing of individual tools and banks of tools. With increased emphasis on lower tool temperatures, many changes can come about. Single-point turning tools, for example, may be replaced by rotary multitoothed cutters. Identical tools may be mounted on turrets so that a single tool would cut one part and then cool during the next three or four cycles. Use of turrets of identical tools may also reduce down time for tool changes. One tool would be in the cutting position, one correctly set in standby and one in process of reconditioning. The turret will index automatically as required. Toolholders and similar devices will, prior to complete automation, give a constant indication of tool condition. After a period as indicators, such devices will evolve as controls and will replace the tool automatically when certain minimum conditions are not met.

Changes in Plant

Many factors, auxiliary to actual production, have made tremendous advances in recent years. All point to the future flexibility and integration of production processes. Factory lighting started out as point sources with incandescant lamps, progressed to line sources with fluorescents and is now on the verge of area sources with new plastic materials that produce light under electrical stimulation. Temperature, humidity, circulation and filtration of air for either personnel comfort or process accuracy are now easily controlled.

All the condition elements of plant buildings can now be exactly controlled. With this control have come new concepts of structure design and fabrication. The controlled conditions building even lowers the noise level of production spaces through use of acoustical materials.

The production space has seen vast changes too, Multifloor structures were used to increase the available space under one roof. As straight line production came in, and with it new ideas of handling materials in process, physical dimensions of individual floors were insufficient. The new plant covers a huge area and has but a single floor. Concurrent with this change was the change in structure walls. Originally, a building was supported by load bearing walls. Gradually, after the coming of structural steel, a building was supported by columns and the walls became curtains separating the work spaces from the outdoor conditions.

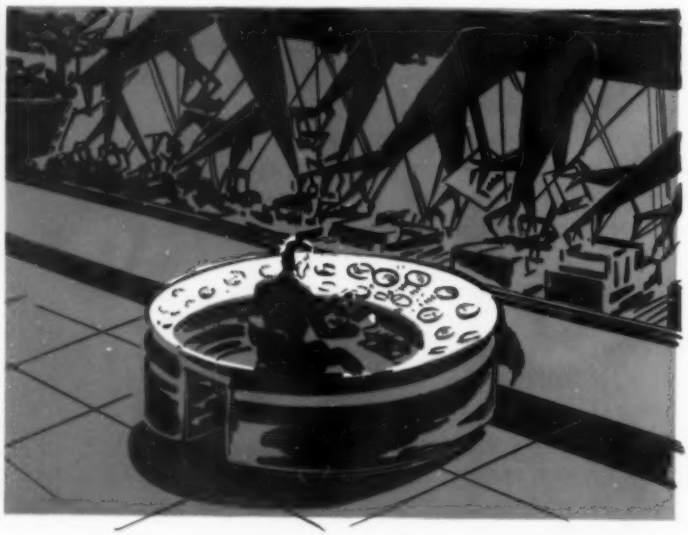
All changes seem to occur with movements similar to a pendulum. Effort is expended on progress in one direction by a pioneer. The pioneer is imitated, his ideas are improved and rapid progress results. As competition grows keen in the new direction, another pioneer will strike out in a different direction and the process repeats itself. Frequently the new direction is the one from which the first pioneer deviated.

With nuclear power, it is possible to foresee the recentralization of power in production. This is even more probable as machine functions are tied together in automation. A single power source would

require but one control for an integrated production process.

The same pendulum movement is seen in many other places. Walls of production spaces are again carrying load. Huge throatless presses of the future will be individual buildings with the walls acting as the vertical members. Column spacing in standard plants is being extended to permit greater flexibility in use of production space. The optimum condition will be no columns, no obstructions and load carrying walls. Airplane factories now have clear widths of over 200 feet and several test facilities have been constructed without interior columns. This progress is being speeded by new designs for structural assemblies and lighter building materials and techniques.

The materials of the future will be no less dramatic than those of the present. Most modern cutting operations have been speeded through the use of carbide tools. Since there is a wide gap between the hardness of carbides and diamonds, it is safe to predict that harder materials than carbides will be synthesized. Here again nuclear energy may come to the fore. Never before have such pressures and temperatures been available and under control as those possible with nuclear reactions. Combining this energy with pure carbon might result in synthetic diamonds. Certainly the gap will be greatly reduced.



Ceramic-metallic materials are just at the dawn of their usefulness. There are so many possible combinations of the constituents of these materials and so few have been studied that the properties of which they are capable are not even indicated. As the materials for future tooling are now vague, so are the materials on which the tools will work.

The present state of machine obsolescence is a healthy sign because machines do not become obsolete until their replacements are at hand. That there are so many obsolescent machines now is not so much a reflection on replacement methods as it is a measure of progress. Also, leaders in the direction of automation indicate that answers to current problems are being found faster than new problems are arising.

The Human Element

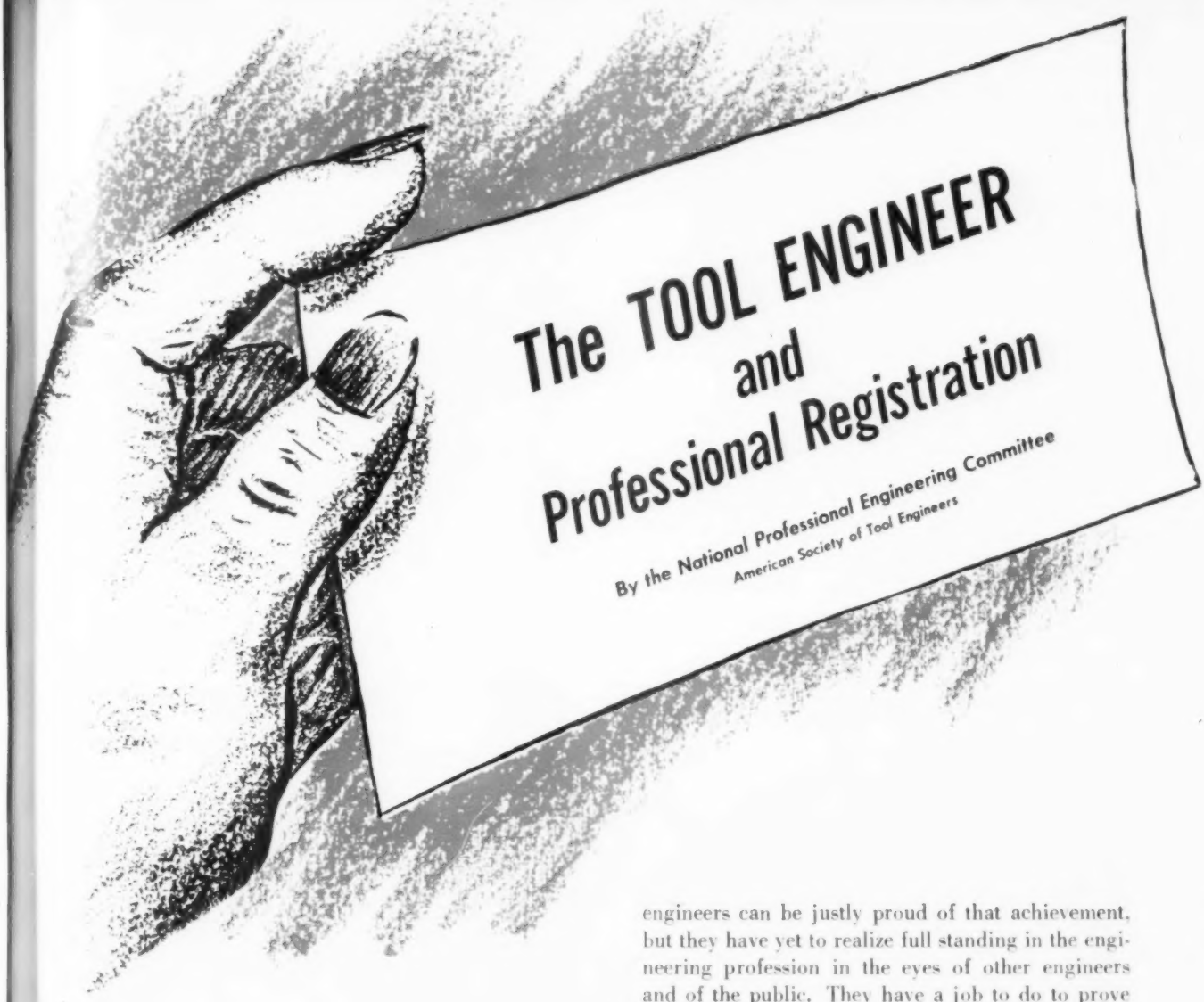
Technical progress is being made rapidly, yet it is under control and moving toward well-defined goals—the removal of human drudgery, especially from repetitive work. Political, economic and socialogic progress is not as obvious, and much thought must be given to the human element. Technical personnel must always recognize the human problems their engineering skill is creating.

It is, at the present time, much easier to imagine factories churning out consumer goods and production machinery without people than it is to guess what the people who would ordinarly man those factories will be doing. It is safe to assume, based on past experience and the knowledge that suitable answers must be found, that these people will be both gainfully and interestingly occupied.

Starting with the Industrial Revolution, it has been demonstrated that as machines take the labor out of laboring, new needs for human services arise. As people have more leisure time, they require more goods and services. Since gainful employment must remain fundamental to the economic system, it can be guessed that much of the gainfully occupied time will be spent in designing new products for use during leisure time. Having more time for leisure, requiring new products and having more time to devote to the design of new products will form a cycle that can rapidly raise the standard of living.

Man's wants can never be satisfied. As each new desire is fulfilled, several more arise to clamor for satisfaction. Where this will lead and what the future standard for the standard of living will be, cannot be guessed. Technical personnel, however, will both dream up new wants and arrive at methods for fulfilling the desires conceived by others.

The world is at the dawn of a new era that will have far-reaching effects on life as it is now led. Production, selling, service functions, physical labor and living conditions will undergo drastic changes and take on new dimensions. It is an era that should be approached with joy rather than fear. The emancipation from physical labor of the human race is at hand. The machine of the future will not be throwing people out of employment but will be freeing them from the necessity of laboring. It is not possible to automate executives, tool engineers or ideas, but automation can offer the opportunity and the capacity for living that the human race has never had before.



The TOOL ENGINEER and Professional Registration

By the National Professional Engineering Committee
American Society of Tool Engineers

A TOOL ENGINEER must, first of all, be a practical mechanic like his predecessors but he also makes use of scientific and engineering principles and techniques to help solve his problems. A grasp and utilization of scientific knowledge and methods is what distinguishes an engineer from a craftsman and artisan.

Tool engineering, as a profession, is comparatively new. Engineering was practiced in other fields long before it was consciously adopted for tooling and production. Because of the achievements of engineers in many lines, the name of engineer has become one of distinction, and those qualified to bear it have found a common bond in a profession that has been taking on a definite identity and set of standards. Tool engineers believe they are part of that profession and are concerned with establishing their rightful place in it.

Tool engineering has received unquestioned recognition in industry because it has been responsible for a large part of today's industrial progress. Tool engineers can be justly proud of that achievement, but they have yet to realize full standing in the engineering profession in the eyes of other engineers and of the public. They have a job to do to prove their right to a respected place in the engineering profession and to use the name of engineer. The way is clear, and that is through professional engineering registration.

What Professional Registration Means: Professional engineering registration is a legal device which enables engineers to demonstrate their worthiness to practice their profession. Essentially, registration has been established to protect the public from the unqualified who offer their services as engineers. Public welfare demands that reasonable standards of competence and ethics be required of those professing to practice medicine, law and engineering because they are entrusted with the protection of life, health, rights and property. The states regulate these professions in this country.

Legal control of engineering has not existed as long as that of the older professions. The first engineering registration law was passed in Wyoming in 1907. Since then registration laws have been introduced in every state and territory. About 160,000 engineers, over half the profession, are already registered, and no doubt all will be registered in time.

time. This will result because unregistered engineers would be at a serious disadvantage.

How Registration Is Conducted: Because each state determines its own standards, requirements and controls for engineering registration differ from state to state. In general, an engineer is required to show that he has had a certain number of years of engineering experience and to pass an examination to demonstrate the mastery of engineering fundamentals.

Formal education may be substituted for part of the engineering experience but is not a necessity. A person is certified as a registered professional engineer after he has met specified requirements. Nominal fees must usually be paid to secure and maintain registration. Normally a Board in each state is empowered to carry out the provisions of the law, to examine the qualifications of the applicants for registration and to take necessary steps to enforce the law.

An engineer, registered by examination in one state, generally can secure reciprocal registration in other states with equivalent standards. Because requirements and viewpoints differ from state to state, some barriers to reciprocity exist. Uniformity for fuller reciprocity is a goal towards which professional engineers are striving.

Professional engineering registration is enforced by regulating either the use of the title or the actual practice of engineering. Both methods of regulation have been upheld by the courts. The first aims at stopping the misappropriation and abuse of the title of engineer. As a rule, a person may not advertise or otherwise publicly represent himself as an engineer, or his business as engineering, unless he is registered. The second method includes steps to stop the nonengineer from practicing the profession of engineering publicly and to oust the incompetent and unworthy from the profession. The rights of the qualified engineer are preserved to enable him to practice without unreasonable restriction, encroachment or unscrupulous competition.

Engineers must never forget that the basic purpose of registration is to protect the public health and welfare and not to benefit their profession. Legislation to protect any particular profession would be hard to defend. However, professional registration does definitely benefit the engineering profession because it puts the force and sanction of law behind the desires of engineers to create and maintain high and worthy standards. Qualified and ethical engineers are aided in their natural professional aspirations to contribute significantly to human welfare because such ideals coincide with the best interests of society.

Members of the National Professional Engineering Committee, authors of this article. In the photograph are Leslie C. Seager, V. H. Gallichotte, L. E. Doyle (chairman), Herbert G. Heimann, Howard W. Gross, William A. Dawson. Members of the committee not shown are Hugo L. Aglietti and Clyde T. Mooney.

What Professional Engineering Is: If professional engineering is to be regulated, there must be definitions of what it is and who is a professional engineer. The formal definitions found in the laws of different states vary to satisfy the legal background in each case. Typical definitions are found in the "model law" approved by thirteen national engineering societies and accepted as the basis for the acts of many states. The "model law" says:

Engineers in Training—Summary of Requirements for Registration (In the United States and Canada)

State	Application Fee	Experience Years (including college)	College Years Acceptable as Experience	Age (minimum)	References (character-ability)	Examination (oral or written)	Length of Examination	Reference Material Permitted During Examination	Passing Grade (minimum %)	Separate Exam Each Branch	Annual Fee
Alabama	No Provision										
Arizona	$10.00	4			3	W & O	2 days			yes	
Arkansas	$ 5.00	none	(a)	none	yes	W	1 day	yes	75	no	$2.00
California	$ 5.00	4			3	W	8 hr	no	70	no	$2.00
Colorado	$10.00	4	4		5(t)	W			70		$ 5.00
Connecticut	$ 5.00	6	4		yes	W	6 hr	yes		no	none
Delaware	$ 5.00	none		21	5	W	8 hr	yes	70	yes	none
Florida	none	none	deg	none	yes	W	8 hr	yes	70	yes	none
Georgia	$ 5.00	4	4	20	5	W	6 hr	yes pm	60	no	none
Idaho	No Provision										
Illinois	$10.00	4	(f)	none	5	(g)	1 day	yes	70	no	$3.00
Indiana	$ 3.00	4	4	none	5	W	1 day	yes		no	$5.00
Iowa	$15.00		4		none	W	8 hr	yes pm	70	no	none
Kansas	No Provision										
Kentucky	$ 4.00	4			yes	W	8 hr	no		no	
Louisiana	No Provision										
Maine	No Provision										
Maryland	$10.00	4	deg	none	5	W	8 hr	yes	set by board	no	none
Massachusetts	No Provision										
Michigan	$15.00	4		21	no	W	8 hr	yes	70	no	
Minnesota	$10.00	4	4	none	3	W	8 hr	yes	65	yes	none
Mississippi	No Provision										
Missouri	$ 5.00	none	none	21	5	W & O	1 day	yes		no	$5.00
Montana	$10.00	4	4		5(t)	W		yes part 2	70	(s)	
Nebraska	No Provision										
Nevada	$10.00	4			yes	W	8 hr	yes	70	no	$5.00
New Hampshire	No Provision										
New Jersey	$ 5.00	4	4		yes	W	8 hr	yes	70	no	none
New Mexico	No Provision										
New York	$15.00	8	4		yes	W	8 hr	yes	75	no	none
North Carolina	No Provision										
North Dakota											
Ohio	$ 5.00	4			5	W	16 hr	yes pm	70	yes	
Oklahoma	$10.00	4									$2.00
Oregon	No Provision										
Pennsylvania	$10.00	4	4	none	5	W	6 hr	yes	70	no	none
Puerto Rico	$10.00	none	4	none	1	W	16 hr	yes	60-70 (u)	no	none
Rhode Island						No Provision					
South Carolina	$ 5.00	4	4	none	yes	W	8 hr	yes	70	yes	none
South Dakota	No Provision										

Nevada	$10.00	4			yes	W	8 hr	yes	70	no	$5.00
New Hampshire	No Provision										
New Jersey	$ 5.00	4	4		yes	W	8 hr	yes	70	no	none
New Mexico	No Provision										
New York	$15.00	8	4		yes	W	8 hr	yes	75	no	none
North Carolina	No Provision										
North Dakota											
Ohio	$ 5.00	4			5	W	16 hr	yes pm	70	yes	
Oklahoma	$10.00	4									$2.00
Oregon	No Provision										
Pennsylvania	$10.00	4	4	none	5	W	6 hr	yes	70	no	none
Puerto Rico	$10.00	none	4	none	1	W	16 hr	yes	60-70 (u)	no	none
Rhode Island						No Provision					
South Carolina	$ 5.00	4	4	none	yes	W	8 hr	yes	70	yes	none
South Dakota	No Provision										
Tennessee	No Provision										
Texas	none	4			3	W					none
Utah	No Provision										
Vermont	No Provision										
Virginia	$25.00	6	4	21	yes	W	2 days	yes	70	yes	none
Washington	$10.00	4			5					no	
West Virginia	$ 5.00	4		21	3	W	8 hr	yes	70	no	
Wisconsin	$10.00	4	4	none	3(t)	W	8 hr	yes	70	no	none
Wyoming	No Provision										
Washington, D.C.	$ 7.50	4	4	21	5	W & O				yes	
Canada											
Quebec	No Provision										
Ontario	No Provision										

a. Requirement approximates engineering degree to become engineer in training.

f. College education not required. Up to 3 years of credit allowed without a degree, 4 years with one degree; and up to two years additional for graduate study.

g. The act specifies written, or written and oral examinations but examinations have been almost entirely written.

s. Law applies only to civil engineers and land surveyors.

t. Three references must be from registered engineers.

u. Passing grades are 60% for parts 1 and 2, 70% for part 3.

Professional Engineering—Summary of Requirements for Registration (In the United States and Canada)

State	Application Fee	Experience Years (including college)	College Years Acceptable as Experience	Age (minimum)	References (character-ability)	Examination (oral or written)	Length of Examination	Reference Material Permitted During Examination	Passing Grade (minimum %)	Separate Exam Each Branch	Annual Fee
Alabama	$25.00	4	4		5	W	2 days	yes	70	yes	$ 5.00
Arizona	$25.00	8		25		W & O	2 days	yes, pt 2		yes	
Arkansas	$25.00	4	2	21	yes	W & O	2 days	yes	75	yes	$15.00
California	$15.00	6	(b)	25	3	W	8 hr	yes	70	yes	$ 6.00
Colorado	$15.00	8	4		5(t)	W			70	yes	$ 5.00
Connecticut	$15.00	10	4		yes	W	12 hr	yes		yes	$ 2.00
Delaware	$20.00	8	4	25	5	optional		yes	70	optional	$ 2.50
Florida	$35.00	4 & deg	deg	24	yes	W	(d)	yes	70		$10.00
Georgia	$15.00	8	4	25	5(t)	W	(e)	yes	60	yes	$ 3.00
Idaho	$25.00	8	4	none	5(t)	W & O	2 days	no	70	yes	$ 6.00

Idaho	$25.00	8	4	none	5(t)	W & O	2 days	no	70	yes	$ 6.00
Illinois	$20.00	8	(f)	none	5	(g)	2 days	yes	70	(h)	$ 3.00
Indiana	$25.00	8	(i)	none	5	(g)	2 days	yes		(j)	$ 5.00
Iowa	(k)	6			5(t)	W & O	8 hr	yes, pm	(l)	yes	$ 2.00
Kansas	$25.00	(c)	4		5	W & O	2 days	yes, pt 4	70	yes	$10.00
Kentucky	$25.00	8	4	none	yes	W	2 days	yes	70	yes	$ 6.00
Louisiana	$25.00	(m)	4	none	5	W & O	3 days	yes	70	yes	$ 5.00
Maine	$15.00	8	4		5	(n)	1 day	yes	75	yes	$ 2.00
Maryland	$25.00	4 & deg	deg	35	5	W	16 hr	yes	set by board	yes	none
Massachusetts	$15.00	8	4		yes	W				yes	$ 2.00
Michigan	$15.00	8		21	3	W	2 days	yes, pt 1	70	yes	$ 3.33
Minnesota	$15.00	(o)	(o)	25	6	W & O	8 hr	yes	65	yes	$ 5.00
Mississippi	$25.00	5	4	21	3	W				no	$ 5.00
Missouri	$25.00	8	5	24	5	W & O	2 days	yes		(j)	$ 5.00
Montana	$20.00	8	4		5(t)	W & O	2 days	yes, pt 2, 3	70	(s)	$ 5.00
Nebraska	$15.00	8	4	25	yes	W & O	1 day	yes	70	yes	$ 4.00
Nevada	$25.00	8		21	yes	W	8 hr	yes	70	yes	$ 5.00
New Hampshire	$25.00	4	4		5	(n)	varies			yes	$ 1.00
New Jersey	$20.00	8	4	25	yes	W	13 hr	yes	70	yes	$ 5.00
New Mexico	$15.00	8	4	none	5	W & O				no	$ 5.00
New York	$20.00	12	4	25	yes	W	12 hr	yes	75	no	$ 2.50
North Carolina	$25.00	4 & deg	4	21	6	W	1 day	yes	70	no	$ 5.00
North Dakota											
Ohio	$15.00	8	4		5	W	2 days	yes, pm	70	yes	$ 3.00
Oklahoma	$25.00	8	4	25		W & O				yes	$ 5.00
Oregon	$10.00	6		21	yes	either				no	$ 5.00
Pennsylvania	$25.00	8	4	25	5	W	7 hr	yes	70	yes	$ 2.00
Puerto Rico	$15.00	4	4	none	1	(p)	16 hr	yes	60-70 (u)	no	none
Rhode Island	$10.00	8		30	5	W & O	2 days	yes	80	no	$ 2.00

Idaho	$25.00	8	4	none	5(t)	W & O	(e)	yes	60	yes	$ 3.00
Illinois	$20.00	8	(f)	none	5	(g)	2 days	no	70	yes	$ 6.00
Indiana	$25.00	8	(i)	none	5	(g)	2 days	yes	70	(h)	$ 3.00
Iowa	(k)	6			5(t)	W & O	8 hr	yes, pm	(l)	(j)	$ 5.00
Kansas	$25.00	(c)	4		5	W & O	2 days	yes, pt 4	70	yes	$ 2.00
Kentucky	$25.00	8	4	none	yes	W	2 days	yes	70	yes	$10.00
Louisiana	$25.00	(m)	4	none	5	W & O	3 days	yes	70	yes	$ 6.00
Maine	$15.00	8	4		5	(n)	1 day	yes	75	yes	$ 5.00
Maryland	$25.00	4 & deg	deg	35	5	W	16 hr	yes	set by board	yes	$ 2.50
Massachusetts	$15.00	8	4		yes	W				yes	$
Michigan	$15.00	8		21	3	W	2 days	yes, pt 1	70	yes	$
Minnesota	$15.00	(o)	(o)	25	6	W & O	8 hr	yes	65	yes	$
Mississippi	$25.00	5	4	21	3	W				no	$ 5.00
Missouri	$25.00	8	5	24	5	W & O	2 days	yes		(j)	$ 5.00
Montana	$20.00	8	4		5(t)	W & O	2 days	yes, pt 2, 3	70	(s)	$ 5.00
Nebraska	$15.00	8	4	25	yes	W & O	1 day	yes	70	yes	$ 4.00
Nevada	$25.00	8		21	yes	W	8 hr	yes	70	yes	$ 5.00
New Hampshire	$25.00	4	4		5	(n)	varies			yes	$ 1.00
New Jersey	$20.00	8	4	25	yes	W	13 hr	yes	70	yes	$ 5.00
New Mexico	$15.00	8	4	none	5	W & O				no	$ 5.00
New York	$20.00	12	4	25	yes	W	12 hr	yes	75	no	$ 2.50
North Carolina	$25.00	4 & deg	4	21	6	W	1 day	yes	70	no	$ 5.00
North Dakota											
Ohio	$15.00	8	4		5	W	2 days	yes, pm	70	yes	$ 3.00
Oklahoma	$25.00	8	4	25		W & O				yes	$ 5.00
Oregon	$10.00	6		21	yes	either				no	$ 5.00
Pennsylvania	$25.00	8	4	25	5	W	7 hr	yes	70	yes	$ 2.00
Puerto Rico	$15.00	4	4	none	1	(p)	16 hr	yes	60-70 (u)	no	none
Rhode Island	$10.00	8		30	5	W & O	2 days	yes	80	no	$ 2.00
South Carolina	$15.00	8	4	none	yes	varies	8 hr	yes	70	yes	$ 5.00
South Dakota	$20.00	8	4	21	yes	W & O				yes	varies
Tennessee	$25.00	4			3	W	2 days	yes	70	yes	$ 5.00
Texas	$25.00	8	4		5	W & O	3 days	yes, pt 3	70	yes	$ 5.00
Utah	$15.00	8	4		5	W & O	2 days	yes, pt 1	70	yes	$ 1.00
Vermont	$15.00	7	4		5	(w)	varies			no	$ 5.00
Virginia	$25.00	8	4	21	yes	W	3 days	yes	70	yes	$ 5.00
Washington	$25.00	8			5					no	$ 5.00
West Virginia	$10.00	7	4	21	5	W	2 days	yes	70	yes	$ 5.00
Wisconsin	$10.00	8	4	none	5(t)	W & O	16 hr	yes	70	yes	$ 5.00
Wyoming	$15.00	8	4	25	yes	W		no		no	$ 2.00
Washington, D.C.	$12.50	8	4	25	5	W & O				yes	$ 2.00
Canada											
Quebec	nil	5	5		nil	W	(x)	(v)	50	yes	$15.00
Ontario	nil	5	4	21	5	(q)	(r)	(v)	50	yes	$13.00

b. Graduation from college is accepted as 4 years of experience. Without a degree, 1 year of college equals ½ year of experience.

c. Engineers having 12 years of acceptable experience may be registered without examinations in Kansas.

d. 2 days of 4 hours each or 4 days of 4 hours each if applicant has not taken examination of engineer-in-training.

e. 1 day with a degree—2 days others.

f. College education not required. Up to 3 years of credit allowed without a degree, 4 years with one degree, and up to two years additional for graduate study.

g. The act specifies written or written and oral examinations but examinations have been almost entirely written.

h. The examination has been divided into 2 parts. The second part contains questions in the four broad divisions of civil, chemical, electrical, and mechanical engineering.

i. Credit allowed for each year of engineering education but for no more than four years. Two years allowed for graduation from nonengineering curricula.

j. The final part of the examination contains groups of questions for major branches of engineering.

k. $15.00 unless applicant is engineer-in-training.

l. 25 percent of grade on interview and experience, 35 percent of fundamental grade, 40 percent of branch grade but must make at least 60 percent in branch to pass with final average of 70 percent.

m. Engineers having 20 years of acceptable experience may be registered without examinations in Louisiana.

n. At discretion of board, mostly written.

o. 8 years of combined education and experience. At least 3 years of experience.

p. Written, if applicant is not an engineer-in-training.

q. None for graduates of engineering schools recognized by council.

r. Nongraduates, 10 to 12 papers of 3½ hours for each paper.

s. Law applies only to civil engineers and land surveyors.

t. Three references must be from registered engineers.

u. Passing grades are 60% for parts 1 and 2, 70% for part 3.

v. Use of reference material depends upon examiner.

w. Examinations are either written or both written and oral.

x. Non-graduates, 11 papers of 3 hours or less.

The term, *professional engineer*, within the meaning and intent of the act shall mean a person who, by reason of his special knowledge of the mathematical and physical sciences and the principles and methods of engineering analysis and design, acquired by professional education and practical experience, is qualified to practice engineering as hereinafter defined, as attested by his legal registration as a professional engineer.

The term, *practice of engineering*, within the meaning and intent of this Act shall mean any professional service or creative work requiring engineering education, training, and experience and the application of special knowledge of the mathematical, physical, and engineering sciences to such professional services or creative work as consultation, investigation, evaluation, planning, design, and supervision of construction for the purpose of assuring compliance with specifications and design, in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works, or projects.

A person shall be construed to practice or offer to practice engineering within the meaning and intent of the Act, who practices any branch of the profession of engineering; or who, by verbal claim, sign, advertisement, letterhead, card, or in any other way represents himself to be a professional engineer, or through the use of some other title implies that he is a professional engineer; or who holds himself out as able to perform, or who does perform any engineering service or work or any other professional service designated by the practitioner or recognized by educational authorities as engineering.

Advantages of Registration: Engineers employed by others are generally not required to be registered. This is particularly true of most tool engineers in industry. An engineer can realize a number of worthwhile benefits from registration.

A survey was made not long ago by the National Council of State Boards of Engineering Examiners. Those questioned were corporations and other organizations able to appraise the situation impartially but informedly. About 90 percent of over 150 replies expressed the opinion that registration is advantageous to the public and to the engineering profession. About 75 percent thought that registration is definitely raising the standards of engineering practice.

Engineers are becoming aware that, by registering, they are helping to form a recognized profession to stand with law and medicine. This is growing out of a loose group of those calling themselves engineers. Tool engineers can help themselves by joining in the movement to boost the profession of engineering.

Time and again engineers, and among them prominent tool engineers, have said that being registered professional engineers gives them a great deal of personal satisfaction. It is a definite accomplishment that an engineer can always display proudly on his record.

Registration can be valuable in critical situations. Courts have ruled, such as in patent cases, that a witness may not testify as an engineer unless registered. A person generally cannot sue to enforce contracts for engineering services unless registered. A person's prestige is enhanced with customers and other contacts if he can be introduced as a registered professional engineer.

In the survey just cited, those questioned were asked if they recognized engineering registration by requiring it for positions of responsibility. Over 30 percent said that they did. Also, about 20 percent said they favored the employment of engineers who are registered. The real significance of these figures is that they show a definite trend in the recognition of professional engineering registration.

It should be remembered that registration has existed in most states for only a few decades. In

Conference reviewing engineering problems in preparation for a registration examination.

that short time an appreciable number of organizations have come to look upon registration as highly desirable for their employees. It is reasonable to expect that as time passes, registration is likely to become even more important for engineering employment and advancement. As one discerning tool engineer has said, the time is approaching when "if you are not registered, you will not in fact be an engineer." Now is the time to prepare for the future.

Real Advantages for You

Professional engineering registration is not just a far away ideal. It has definite advantages for you. It may not be required for your present job, but certainly you want to get ahead. Registration can then be helpful. When the time comes for promotion, an engineer who is registered has one more asset. In industry and in public service, registration is a credit when you apply for a better job, even though registration is not mandatory. Perhaps you have the commendable ambition to go into business for yourself. When you do, you will probably find you cannot advertise or represent yourself as an

engineer unless you are registered. You will be wise to act beforehand to protect your interests.

Many tool engineers have become registered because they have the foresight to realize that tool engineering will grow in professional stature in spite of, if not with them. Registration will then become more important and probably more difficult to obtain. Remember, too, that as you become older, you may find it harder to pass examinations. Even under the best of conditions, a certain interval, usually a minimum of a year, must elapse between the time a person starts and can complete his quest for registration. The time to secure registration is not when it is needed and cannot be obtained in a hurry but now.

How the ASTE Can Help You

The American Society of Tool Engineers is making every effort to help its members secure registration. Every chapter is expected to have a Professional Engineering Committee to inform its members about the details of registration in its state. You can get full information from the chairman of your chapter's committee about what you must do in your state to become registered. The accompanying tabulation specifies briefly the requirements in each state.

Each member of the National Professional Engineering Committee is assigned to a group of states to furnish the chapter committeemen with guidance and complete information concerning the latest developments which have occurred in professional engineering registration.

In many states, a recent engineering graduate or anyone with an equivalent amount of experience may take the theoretical part of the examination while the subjects are still fresh in his mind. Upon passing that part of the examination, the candidate is certified as an engineer-in-training. Then after he has acquired the full amount of experience required, he may receive final registration. In some states, the engineer-in-training must pass a practical examination at the end of his training period.

If you have been in practice for a number of years, you may want to refresh your memory on engineering theory. You can get copies of previous examinations to find out what kinds of questions are asked. When you see these questions, you may find you can answer them easily and can go right ahead and take the examination. If you feel you would like a review, refresher courses are offered in many places, and your chapter's professional engineering committee can inform you about those in the locality. If none are available, your state committeeman can help you and your chapter's committee organize a course.

If you have not completed your education in the fundamentals of engineering, your chapter's professional engineering committee can indicate what you still will need to qualify as a professional engineer and will help you get started in part-time preparatory courses.

Now Is the Time

You will have to make a definite effort to become registered; it will not be handed to you. But then you will find, as have many others, that you did well not to let the opportunity slip by. You will be able to take justifiable pride in a real accomplishment when you receive your certificate of registration as a professional engineer. It will be your badge of competence and worthiness to be a member of a great and learned profession.

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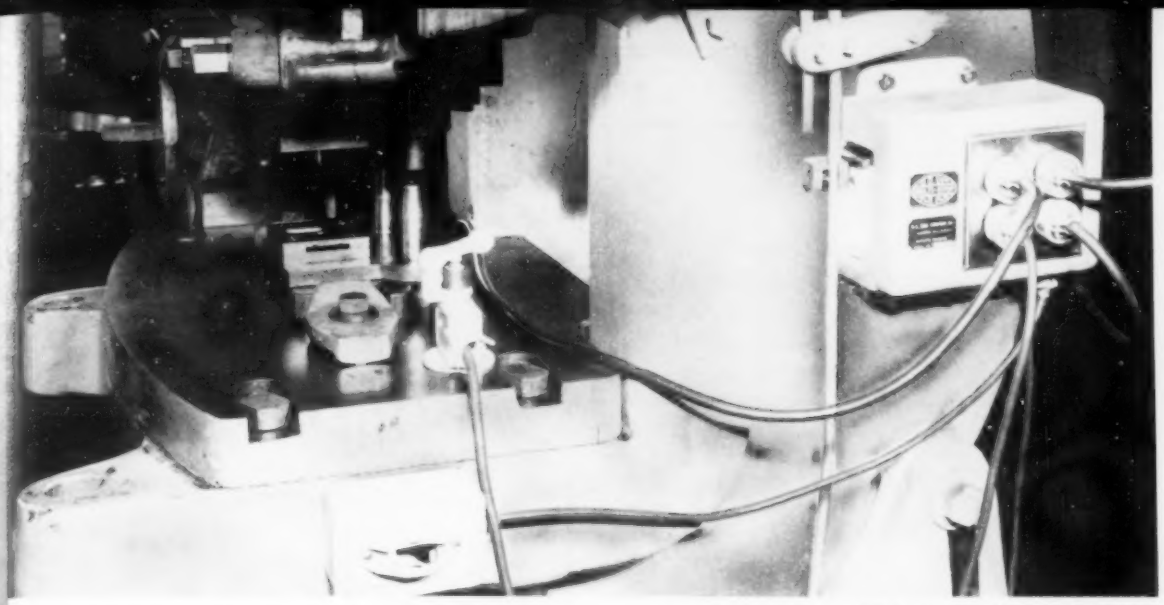
Part of a refresher class in mechanical engineering at Drexel Institute of Technology.



—Photo courtesy U. S. Tool Co., Inc.

Fig. 1. Solenoid-actuated clutch release. The four-outlet box provides for installation of one to four limit switches, as required to check various conditions.

PREVENTING PRESS FAILURES

trouble detectors

By A. F. Gagne, Jr.*

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PRESS FAILURES CAN BE REDUCED by careful die design, and attention to press speeds and alignment. In some cases, however, such efforts can be cancelled out by errors in fabrication, careless die setting, unreliable operators or defective stock. Added to these potential trouble makers are increased press speeds and growing complexity of dies. Mechanical trouble detectors, *Fig.* 1, have been developed to sense jams and stop the press before damage occurs.

Because detectors require regular maintenance and inspection and, in some cases, cost $2,000 or more, their use should be justified. A decision to adopt a particular device may be aided by answers to the following questions:

1. Would a smash cause operator injury?
2. How much dollar value would be destroyed in a wreck—an inexpensive punch or an elaborate die set?
3. Will a down press disrupt production schedules? Will the operator be idle? How long for repairs?
4. Is run small enough to make trouble remote?
5. Will trouble detectors reduce number of operators and cut operating costs?
6. Will controls improve product quality and prevent trouble at subsequent operations?

Detectors for Roll Feeds: Excessively thick stock causes trouble on presses equipped with roll feed mechanisms. In one case a stock increase of 0.008 inch resulted in a jam that could be freed only by unshrinking the tie rods. Jams can be prevented by continuous and automatic calipering of stock. Thickness gages consist of two calipering rolls regulated by a precision switch and solenoid clutch release, *Fig.* 1. Electrical circuits are designed to allow press operation only while solenoid is energized. The press will then stop if electrical failure occurs at any point in the detector system.

Stock width variations outside specified limits often cause production slowdowns. Wide stock can jam in the die guides and too narrow stock results in a weakened scrap skeleton that can pull apart in progressive dies, causing a multistation jam. One type of width detector found to be quite

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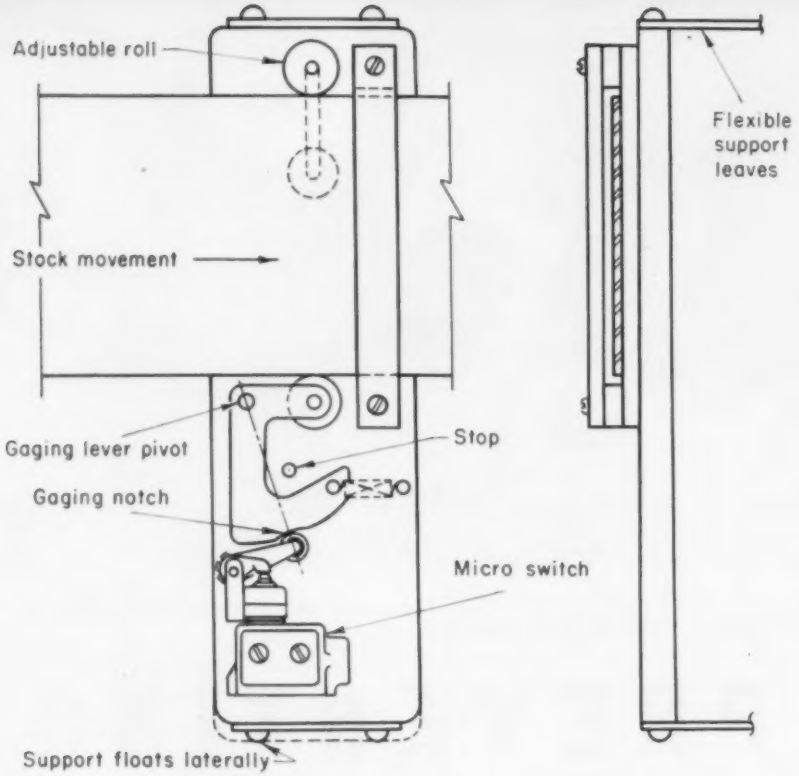


Fig. 2. Stop for detecting stock that is either too narrow or too wide. Stop floats with stock and is adjustable for various widths. Width of gage establishes tolerances.

effective is shown in *Fig.* 2.

Buckle detectors, *Fig.* 3, prevent damage from automatic stock feed jams caused by such die obstructions as slug pop-ups or stripper failure. Jammed material bends up, actuating a precision switch that stops the press. When stock coil is emptied, a second switch stops the press to prevent cutting half blanks.

Built-in Die Set Stops: Improperly indexed stock in close tolerance progressive dies causes punches to nibble partial blanks, possibly chipping pierce punches. Improper indexing can be inexpensively revealed with a spring-backed detector punch. Attached to the top shoe, the detector punch enters a previously pierced hole. If the punch is obstructed by stock, it indicates that indexing is not perfect. Before damage results, the press is idled by a limit switch mounted on top of the punch.

Jams in one station of certain progressive and follow dies will cause strip stock to arch upward ahead of this station. A feeler bar pivoted above the strip and connected to a precision switch automatically stops the press.

Another form of feed check for multistation dies is located at the cutoff station. Full index brings stock forward against a switch, closing it. A second switch, wired in parallel with the first, is opened each stroke by a cam on the crankshaft. The press will run only if the first switch closes the circuit before it is opened by the second.

Stops with spring-loaded punches and precision switches in the top shoe can detect double-headers and stripping failures. Stops of this type are used on machine gun link dies where the blank is cut free from the strip in the last station and formed over two mandrels. A dog-leg cam actuates a stripper that moves horizontally to push the link off the mandrel. With the original design, if the link failed to strip, a wreck occurred when the next link was formed around the first. A simple detector finger solved the problem by stopping the press before reaching bottom stroke.

In most cases, dies with built-in stops must be set in presses with an electrically or pneumatically-actuated clutch. Since most trouble is detected at midstroke or later, the clutch must be released before the die closes. An electropneumatic multiple jaw clutch, *Fig.* 4, can be disengaged by limit switch safeties at any part of the stroke. Electrical control permits continuous run, single stroke or jogging. High torque capacity permits installation directly on crankshaft to 6½-inch OD. In the event of electrical or air pressure failure, the clutch release and the brake sets by automatic spring action.

Detectors for Draw-Through Operations: Occasionally, deep draw dies are fouled by punched-out cup bottoms, jammed incoming blanks or broken draw punches. Piled up blanks destroy the blanking punch. Stock movement is snarled,

ultimately affecting all die stations. An effective mechanism has been developed, *Fig.* 5, to shut off the press when cups are not discharged. Operating sequence is as follows: (1) in closed position, sliding pin blocks discharge hole at bottom half of stroke, catching cup when stripped, (2) detector pin is blocked by cup attempting to enter passage; if cup is missing, shoulder on pin contacts cross bar which actuates limit switch and (3) detector pin and sliding pin retract to release cup which drops out, assisted by lubricant.

Registration Detector for Dial Feed: Dial feeds are vulnerable to jams because of numerous shear points and moving parts. Spring-loaded dial drives prevent dial jams by yielding to obstructions, *Fig.* 6. A timed cam on the crankshaft lowers an inspection pin into a register hole in the dial plate after completion of index. If the pin is unable to enter the hole, a cam attached to the top of the pin remains in the path of the clutch release ring. The clutch is thrown out and a positive stop block halts the crankshaft at the 90-deg position.

Component Inspection in Dial Feed Presses: Mechanisms to detect inverted draw cups consist of a spring-actuated plunger mounted on an outrigger. The plunger enters each cup as it indexes under the ram. On striking an inverted cup, the plunger actuates a precision switch, stopping both dial and press ahead of the ram tools. A manual reset switch prevents restarting of the press without correcting the trouble. To avoid shock on switch and continual flexing of electrical cable, the switch can be mounted on the press frame and operated by a cam or lever system. A similar device, *Fig.* 7, was used on 30-caliber bullet jacket dies.

Motor Load Sensing Devices: High output may be achieved for awhile by overloading presses. Standard motor overload relays and JIC starters are thermal in principle and have an inverse time limit characteristic designed to match motor temperature rise. As a result, these devices are quite sluggish in responding to overload. A press starting with a cold motor could be wrecked before thermal overload protector and the motor were even warmed

Fig. 4. Electropneumatic multiple jaw press clutch. When air pressure is admitted from a solenoid valve through the rotary joint at end of air cyinder, right, clutch is engaged and the separate air brake (not shown) is released.
—Photo courtesy Niagara Machine and Tool Works

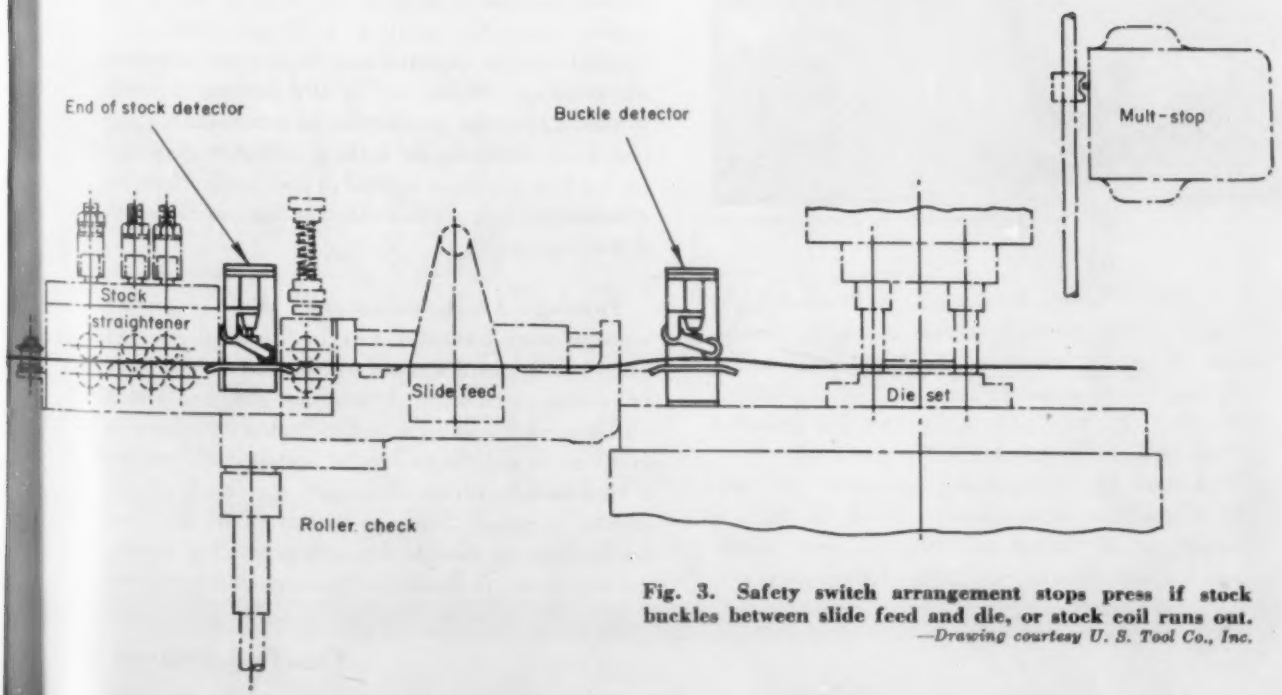


Fig. 3. Safety switch arrangement stops press if stock buckles between slide feed and die, or stock coil runs out.
—Drawing courtesy U. S. Tool Co., Inc.

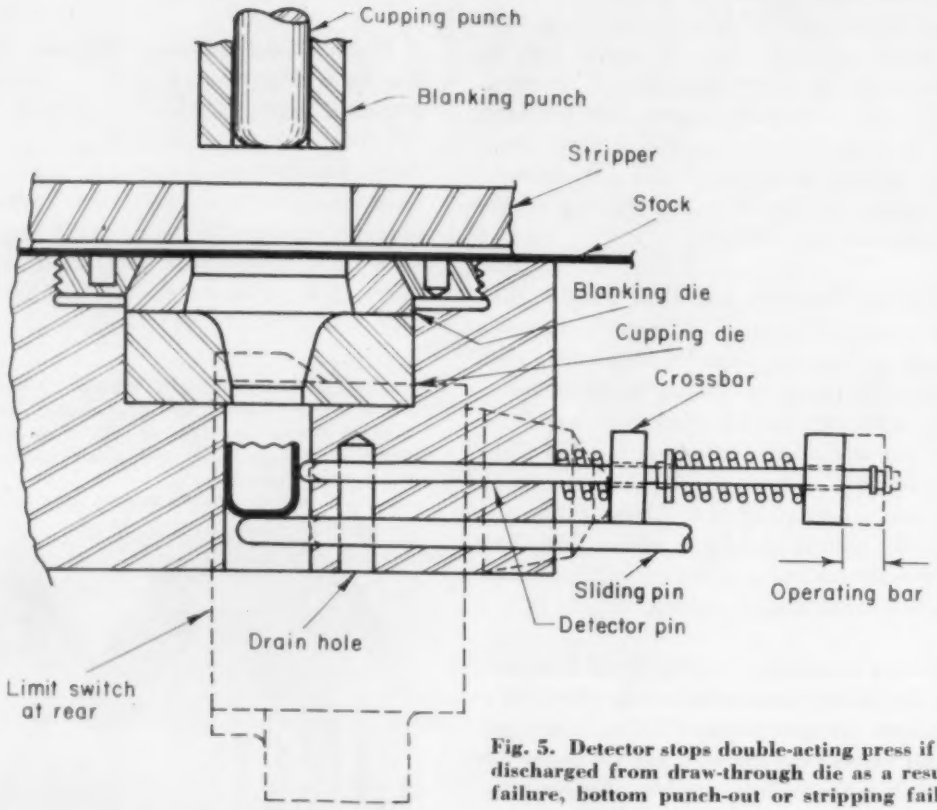
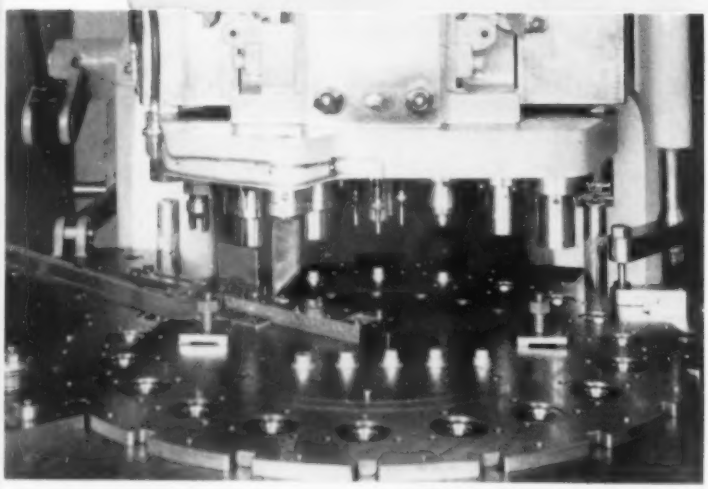


Fig. 5. Detector stops double-acting press if cup is not discharged from draw-through die as a result of feed failure, bottom punch-out or stripping failure.



—Photo courtesy V & O Press Co.

Fig. 6. (left) Dial feed, left, has a positive detent lock and a mechanical dial registration detector pin, right. Pin must enter hardened-steel bushed holes in dial to prevent tools in the ram from hitting the dial.

up. Even if the motor did trip out, the flywheel might drive the press through several damaging revolutions. Generally, motor overload relays are useful only in protecting motors from prolonged overload or excessive starting loads. Something else is needed to furnish overload protection for presses.

Protective overload sensing equipment is available to monitor instantaneous current or wattage demands of the motor and trip the press clutch when trouble occurs. Gradually dulling dies and jams are revealed before resistance overloads the press. In one instance, a punch jammed in an eyelet machine, pulling the die from its holder. The sensing equipment stopped the machine almost instantly, probably averting a broken crankshaft. Typical savings reported are: 86-percent decreased die breakage, 20-percent die life increase between grinds, 22-percent production increase and 75-percent labor reduction by making operators responsible for four machines instead of one. Such protective attachments are not suitable for use on line-shaft driven equipment.

Tonnage Load Indicators: An inexpensive tonnage load indicator can be installed on any press to safeguard against overloading. Indicators are simple mechanical devices that measure stretch of the press frame on a dial indicator calibrated in tons. Such indicators can be installed to operate a limit switch, which disengages the clutch at any selected overload. Tonnage indicators are also useful for making records for reruns and for experimental work. If heeded, a tonnage indicator can

rovide a low-cost answer to control of press over-
ading, a condition that started with World War II
nd has become habitual in some pressrooms.

Overloading may enable the department to main-
ain high production schedules temporarily, but
he long-term result must be poor tool life and
roken gears and crankshafts.

This is the third in a series of articles concern-
ng prevention of power press smash-ups. Subse-
quen articles will discuss overload relief, main-
enance and operation of dies and presses.

Acknowledgments

Appreciation is extended to the following companies for supplying information for this article:

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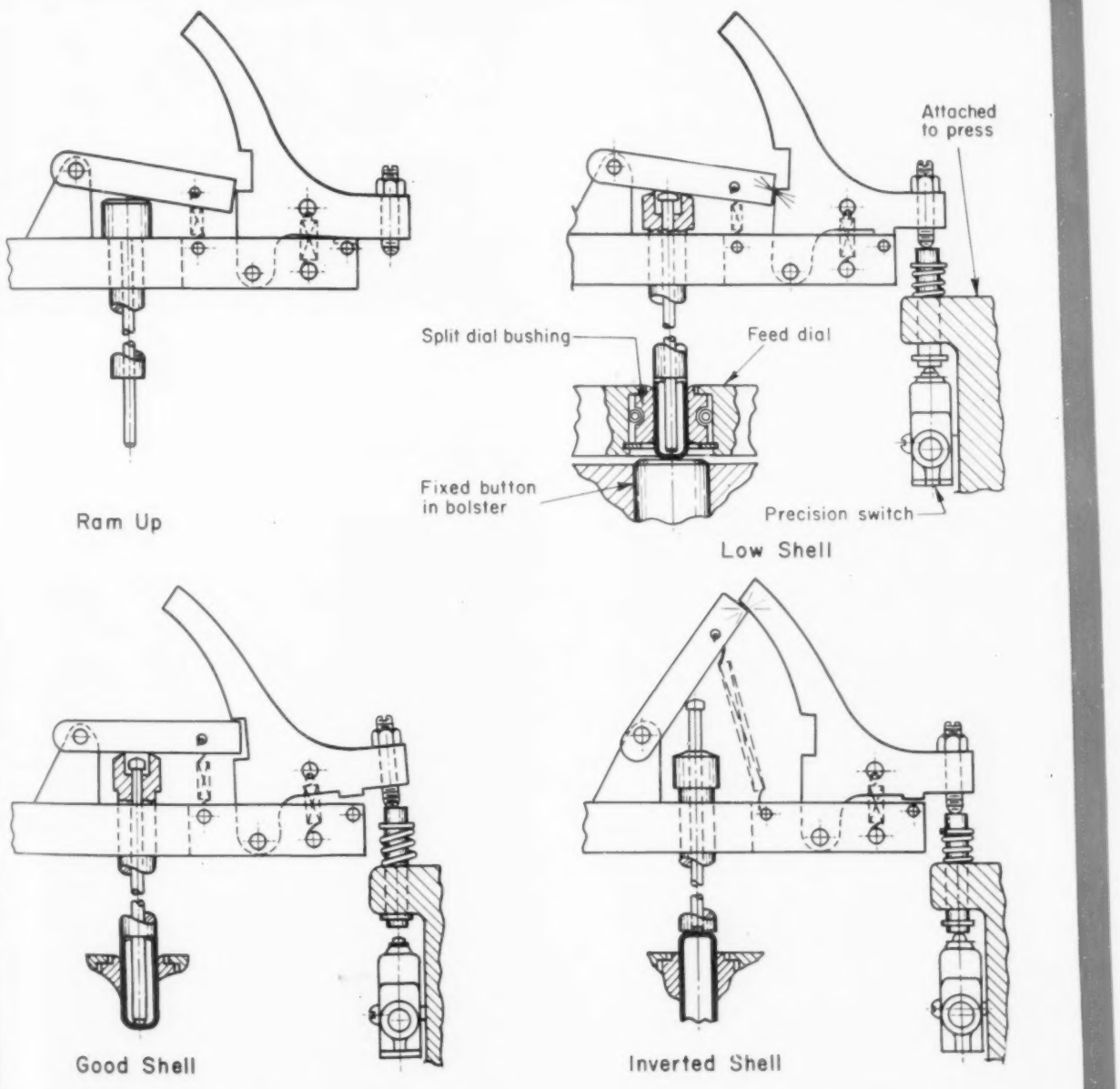
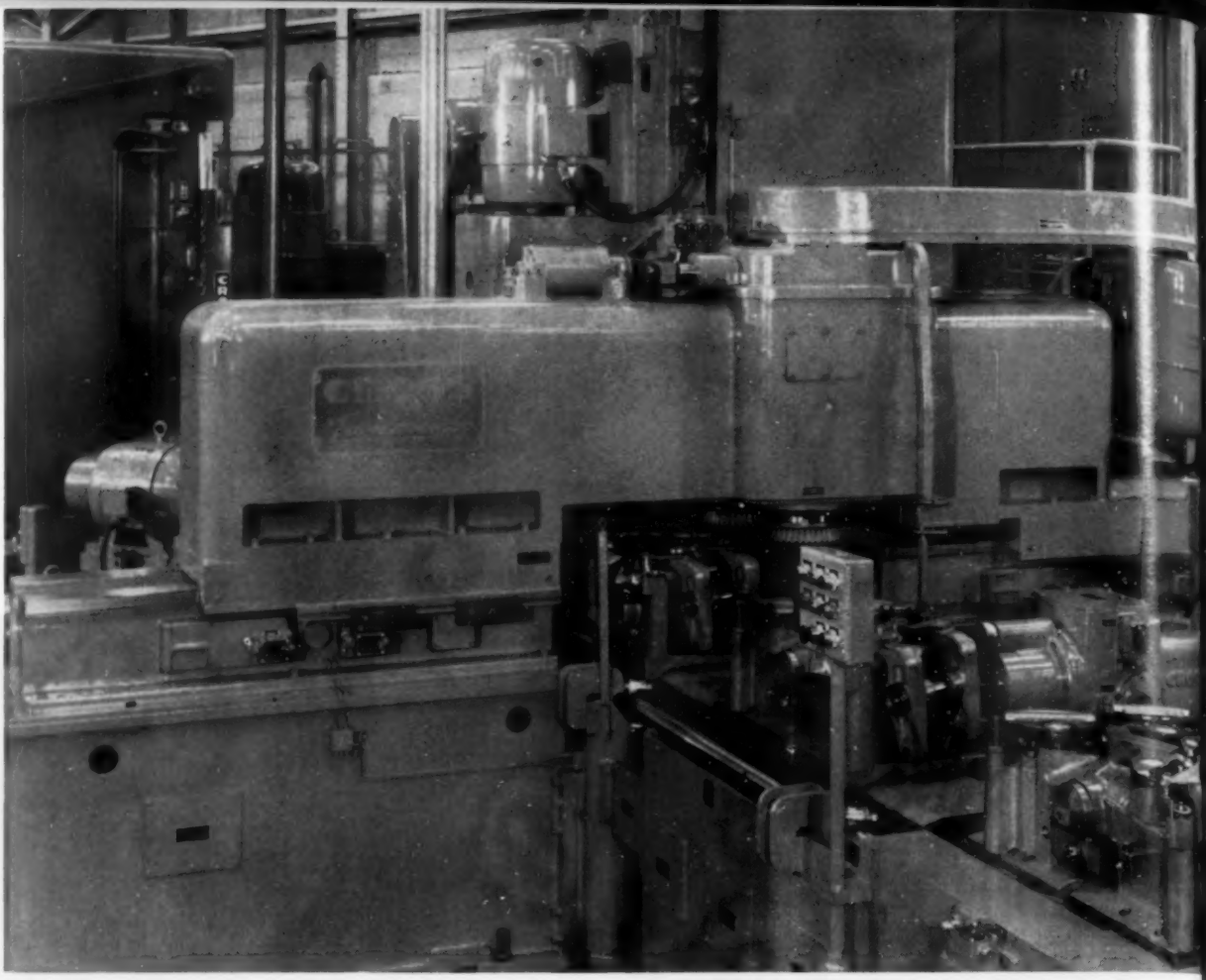
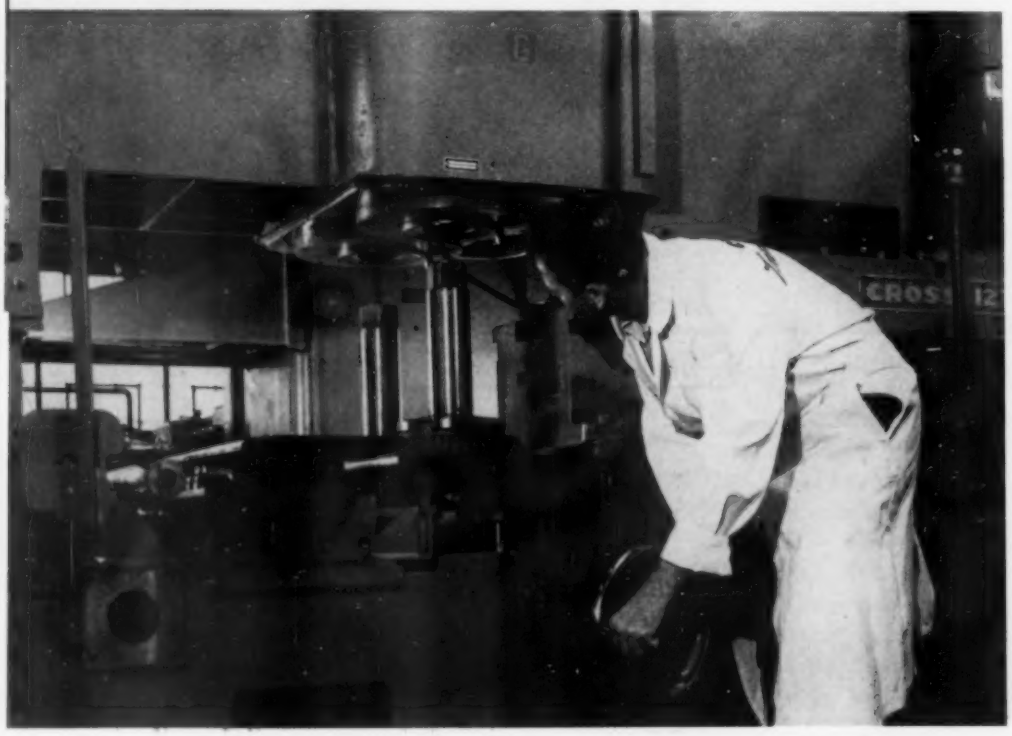
Micro, Div. of Minneapolis-Honeywell .....Freeport, Ill.
Producto Machine Co. .....Bridgeport 1, Conn.
The Minster Machine Co.....Minster, Ohio
Thomson-National Press Co.....Franklin, Mass.

Fig. 7. Automatic detector mounted on ram of dial fed press exposes cups of improper length, empty stations, inverted cups and foreign matter in cups. Detector can be adjusted to length limits of ± 1/32 inch.



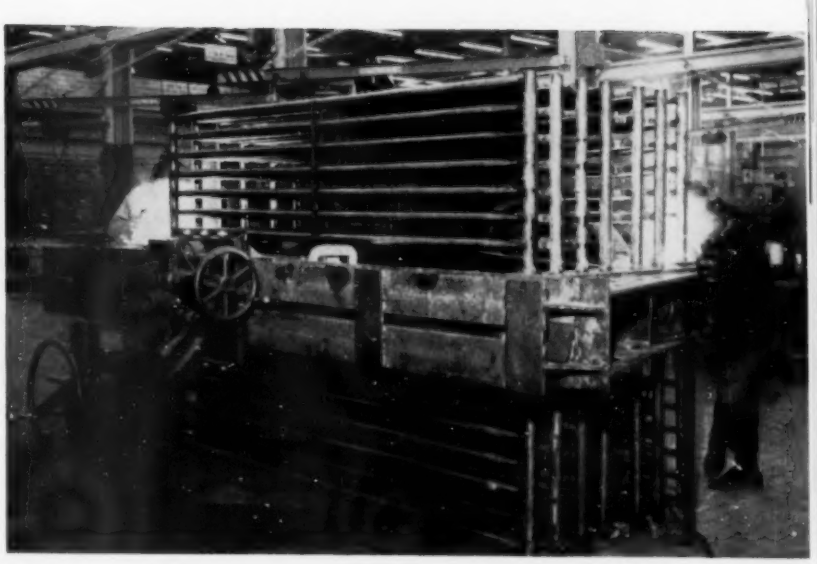


AUTOMATIC FACE MILLING unit is part of special transfer equipment designed by The Cross Co. to completely machine exhaust manifolds. Shown are two face milling stations which process 230 pieces (115 right and left-hand parts) per hour. The palletized work holding fixtures mechanically transfer paired parts from station to station. Cleaning unit automatically removes chips from fixtures after each cycle. See photo below for further details concerning this machine.



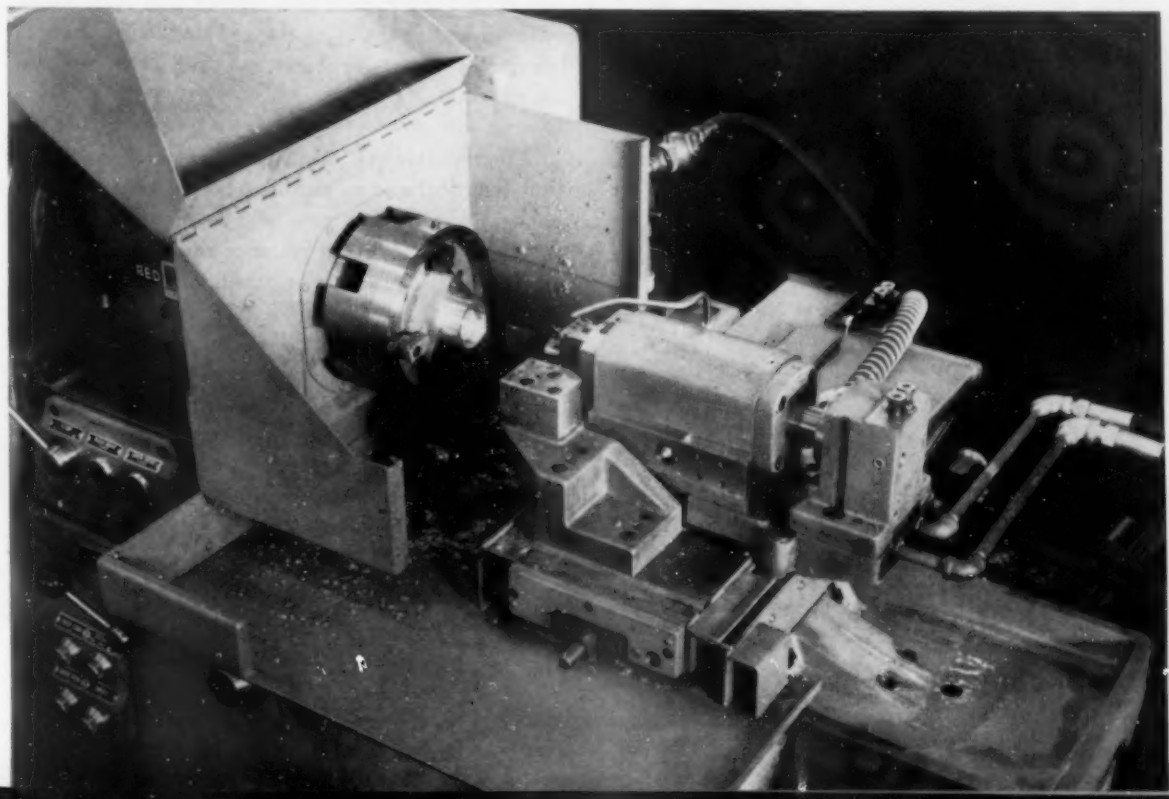
RAPID TOOL CHANGING is facilitated by a dolly-type elevating mechanism embodied in the machine. New multitooth milling cutters are being raised to place after loading on bed rails on a toolholder plate. To further speed the operation the cutters are preset to correct length before installation.

TOOLS at work



WELDING POSITIONER speeds assembly of transformer coolers at GE's new transformer plant at Rome, Ga. The positioner rotates the assembly around the vertical and horizontal axes, enabling the welders to continue downhand welding on any area. The head containing the gearing is adjusted for desired heights.

PRECISION FINISHING of seven surfaces on a gear bearing support is accomplished in this special tooling setup for high production. Workpiece is held in air-operated pull-back finger chuck at left and is further steadied by centrifugal clamp (at top of part). Tooling is mounted on the standard automatic hydraulic cross slide with a bridged-over auxiliary slide. Operations on this Heald Bore-Matic are: finish bore, chamfer, plunge and generate faces.



ultrasonics and industrial cleaning

By William L. McCracken

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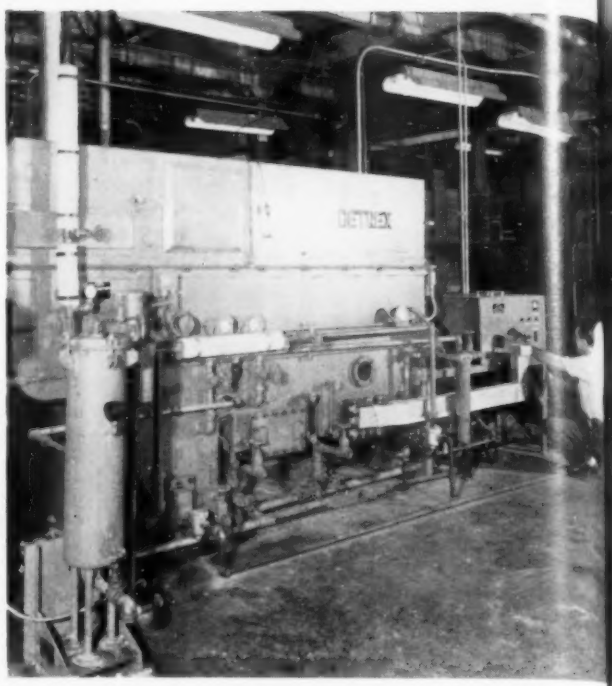


Fig. 1. Ultrasonic cleaning installation powered by a ¾-kw generator (right) which operates a train of two transducers.

This and the accompanying three articles are prepared from papers to be presented at the 1954 Industrial Exposition and Convention of the American Society of Tool Engineers in Philadephia. These papers have been selected because each is of interest and because they are typical of the quality of the Convention papers. The complete program for the technical sessions starts on Page 152.

INDUSTRIAL METAL CLEANING is being rapidly advanced by new applications of power ultrasonics. Several years of ultrasonic research have resulted in a method for fast and thorough removal of dirt from metal parts, *Fig.* 1. Ultrasonic techniques should be considered when other cleaning methods fail to satisfy specifications. For maximum efficiency, ultrasonics are used in addition to and after standard cleaning cycles.

Conventional cleaning techniques remove impurities such as oxides, greases and applied compounds but do not affect smut and related fine residues on cold-worked metallic parts. Ultrasonic cleaning eliminates expensive hand removal of highly adherent smut.

Electrostrictive Method: Research indicates that electrical energy can best be changed to sound energy by three transducing methods—electrostrictive, magnetostrictive, and piezoelectric. Presently, the electrostrictive method, using barium titanate as a transducer, is the leading technique, *Fig.* 2. Barium titanate is a ceramic and can be cast into various shapes to focus sound energy on a particular area. To irradiate an aqueous solution with an ultrasonic intensity of one watt per sq. cm and at a frequency of 100 kc, the voltage necessary for a transducer made of quartz crystal would be 10,000 v. The same result is achieved by ceramic transducers with 1/100 of the voltage. Low voltage permits simple connections to remotely located radio frequency generators. Because of the low

Abstracted from paper 22-T-4, "Ultrasonic Techniques in Industrial Cleaning", to be presented at the 22nd ASTE Annual Meeting. Copies of the complete paper will be available from Society Headquarters.

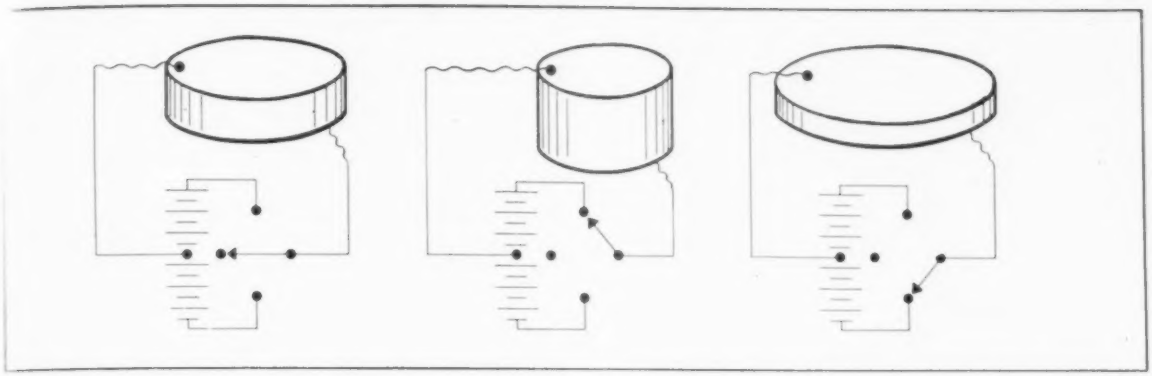


Fig. 2. Electrostrictive effect. Behavior of ceramic material before applying voltage (left) and exaggerated views after applying voltages of either polarity.

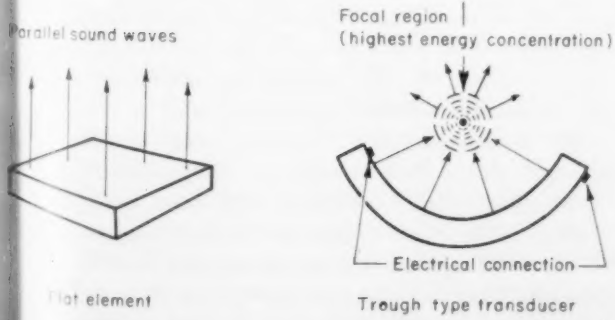
voltage, transducers may also be placed directly in nonpolar cleaning fluids with no fear of shorting. Inefficient diaphragms or acoustic windows are eliminated. After casting and firing, the ceramic is polarized to provide electrostrictive properties.

A flat transducer, *Fig.* 3, emits energy in parallel waves that cover a broad area. Metal cleaning results are much better if the sound energy is concentrated at a specific point or line. Since sound waves can be focused by altering the form of the transducer, curved or trough-shaped transducers are used in ultrasonic cleaning equipment.

Concave and convex surfaces of trough-type barium titanate transducers are coated with silver leaf to form electrodes. Electrical connections are made at each surface. Voltage is applied across the transducer surfaces, resulting in a thickness mode vibration. Acoustical energy emanating from the concave surface is concentrated at a line above the transducer.

The number of transducers used depends upon the size and quantity of parts to be cleaned. Location is unrestricted. Energy radiation can be di-

Fig. 3. Trough-shaped transducer focuses sound energy in one specific area. Flat transducer sends energy in less effective, parallel waves.



Nomenclature

Ultrasonic Energy: Sound energy with a frequency above the audible range.

Transducer: A device that transforms electrical energy to mechanical energy. It is used to produce sound waves for ultrasonic cleaning.

Radio Frequency Generator: An electronic device capable of changing frequency of electrical current.

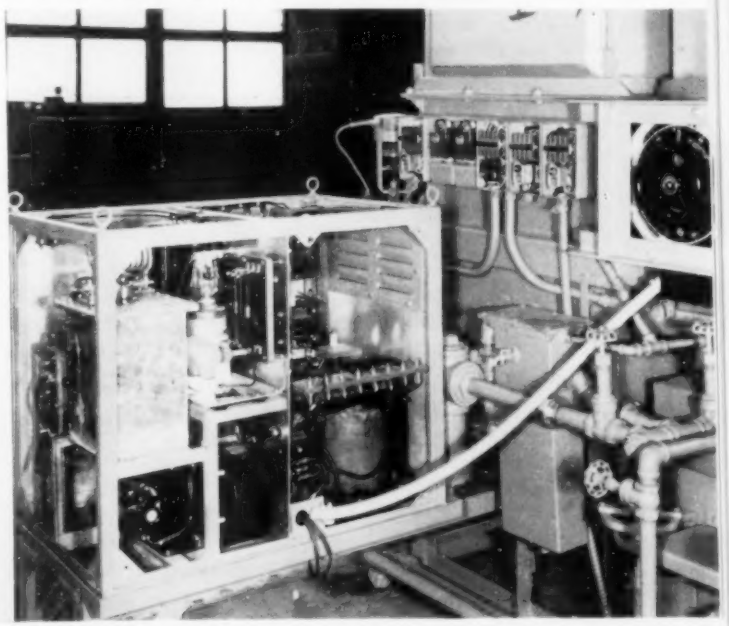
Piezoelectric: Resultant effect when certain natural crystals change dimensions on exposure to alternating current.

Magnetostrictive: Change in length of a bar or stack of suitable ferromagnetic material placed with its length parallel to a magnetic field. If field is alternating, the device will alternately become longer and shorter and produce compressional waves (sound energy) in the surrounding medium.

Electrostrictive: Phenomenon differs from the piezoelectric only because a synthetic polycrystalline material is used. The material is polarized and produces similar results.

Curie Point: Temperature at which a synthetic transducing material will depolarize and cease to function as a transducer.

Fig. 4. Rear view of 2-kw generator used in a typical cleaning installation. Size varies from ½ to 10 kw or more, depending upon cleaning application.



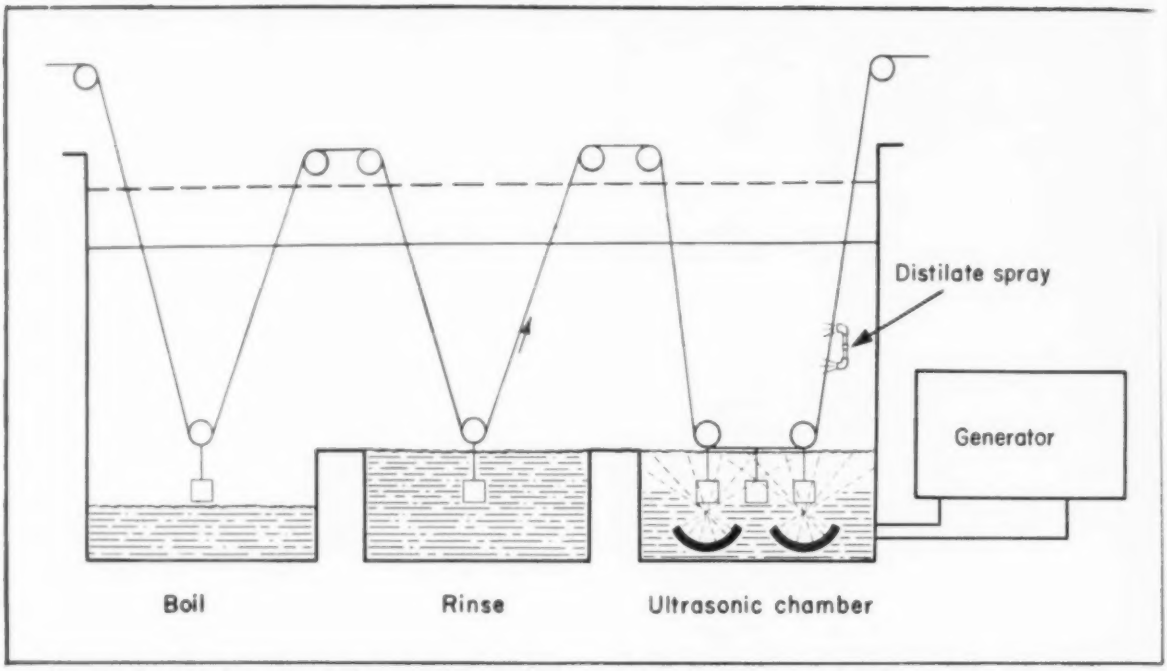


Fig. 5. Typical three-stage solvent vapor precleaning cycle with ultrasonic chamber and two transducers.

rected up or down, or transducers can stand on end along the side of the cleaning chamber. Any combination of these positions can be used. When coupled, transducers may be hooked in series or series-parallel.

Generation: Impedance and average frequency of the transducer train is matched by the power-

Soil Content Before and After Ultrasonic Cleaning.

Method of Cleaning	Soil Content Assemblies per 16 (grams)
Before cleaning	0.035 to 0.050
After 3-stage washer	0.003 to 0.0059
Vapor spray degreasing and ultrasonics	0.0004

supplying radio frequency (RF) generator. Barium titanate transducers receive their power from generators of approximately 400-kc frequency. Operating from a 110-v, 60-cycle line, 2-kw generators, *Fig.* 4, achieve a current output from the transducers at 400,000 cps at about 200 v. Electrical leads are shielded to prevent RF frequency escaping and interfering with nearby electrical equipment. Leads are copper bar, copper tubing or coaxial cable.

Application: Transducers operate in a chamber separate from the standard cleaning tanks. Ultrasonic energy is especially effective for vapor degreasing processes if used to remove final traces of residue after gross soil has been removed, *Fig.* 5. Distillate from the boil chamber, *Fig.* 5, is condensed at the vapor control zone and pumped through spray nozzles, flooding the workpiece as it leaves the ultrasonic chamber. Distillate spray drops into the ultrasonic chamber, flows into the rinse which continuously overflows to the boil chamber. The ultrasonic chamber liquid is filtered, reducing soil suspension to a minimum. When necessary, separate distillation equipment is used to force additional clean condensation to the ultrasonic chamber. Solvent temperature is controlled at approximately 140 F to prevent transducers from reaching the Curie temperature (248 F) which would cause depolarization.

Results of a typical ultrasonic cleaning process are shown in the accompanying table. Ground and lapped automobile hydraulic valve lifter assemblies were cleaned in lots of 16. Previous cleaning methods were improved upon by vapor spray degreasing and ultrasonic cleaning. After cleaning, parts were rinsed with a distilled petroleum solvent. The drainoff was collected in an evaporating dish, allowed to settle for an hour and the clear solvent poured off. The residue was placed on a watch glass, evaporated dry and weighed.

Past attempts to apply ultrasonic energy in some industrial fields have resulted in disappointment. Extravagant claims, combined with poor understanding of basic principles, have slowed progress. Relationships between manufacturers and users of ultrasonic cleaning equipment have been close and have resulted in efficient, high-production cleaning methods.

plastic tooling— when and how

By Benjamin Sokol
Plastics Engineer
Republic Aviation Corp.

Abstracted from paper 22-T-44 "Plastics Fixtures Have Wide Use," to be presented at the 22nd ASTE Annual Meeting. Copies of the complete paper will be available from Society Headquarters.

Fig. 1. Vacuum drill rack of polyester-glass is used in wing fabrication.

WARTIME PRODUCTION gave tremendous impetus to the use of plastics in tooling. Metal shortages forced adoption of nonmetals for new and untried applications. Some were successful; some were dismal failures. The aircraft industry seized upon the new tooling materials because a quantity of tools had to be built quickly and cheaply, because of numerous design changes that required rapid tool changes. Further, in aircraft, there are virtually no straight lines or flat planes. Compound contours are typical and these are the most difficult for which to tool.

Phenolic board, among early types tried, represented an improvement over conventional tooling. It lacked one major property: it could not be molded directly to a contour, but must, rather be filed and ground to shape. An urgent need existed for a stable plastic that could be simply, easily and accurately molded to a given configuration. This need was answered in the form of a family of resins called polyesters.

Polyesters

Polyesters ushered in a new era in tooling. They made it possible to mold to contour a stable reinforced plastic material with little or no heat or pressure. Semiskilled or unskilled labor was adequate for the most difficult tooling jobs. In the early stages of laminate tooling, as it came to be called, a typical drill rack would have been made as follows:

1. A plaster master of the part would be made, or an untrimmed part would be imbedded and backed with plaster.
2. A suitable parting agent would be applied.
3. Resin would be mixed with the proper catalyst; the choice depended on whether room temperature or oven cure was desired.
4. The resin would then be applied to successive layers of a good glass cloth, until build-up to the required thickness was achieved.
5. If room temperature cure was satisfactory, the tool would then be allowed to stand until it cured. If an oven cure was planned, the entire plaster and laminate layup would be encased in a polyvinyl alcohol bag and a vacuum drawn within. The unit would then be moved into an oven for cure.

Thousands of tools were produced: simple trim fixtures, complicated drill and assembly units, *Fig.* 1, nesting fixtures, installation fixtures, welding fixtures and routing fixtures. Despite refinements the procedure remains basically unchanged.

The most important refinement was the introduction of preimpregnated reinforcing cloth. It was found that polyesters could be soaked in glass

cloth and allowed to pregel so that a catalyzed, slightly sticky, resin-saturated cloth resulted. The preimpregnated cloth had desirable characteristics such as "tack" and "drape" which allowed a neat, clean and rapid layup of the potential tool. It had the further characteristic that an incompleted tool could be left overnight without deterioration. The preimpregnated layup required an oven cure and vacuum bag pressure.

Another refinement of early laminate tooling methods involved the use of molded-in reinforcements. Large, almost flat, contours had a tendency to warp out of shape when cooling, unless a series of stiffening ribs was incorporated. These ribs could consist of steel plate, masonite or other tooling materials. This increased its stability considerably. On occasion metal strips were molded into laminates at points of wear.

The stability of laminate tooling is attested by the fact that certain plastic drill and assembly fixtures have been in constant service for seven years with no perceptible change in dimension.

Casting Phenolics

Concurrent with the development of polyester laminations was that of casting phenolics. Early attempts with this material were failures. Cast phenolic fixtures shrank out of tolerance in curing and, after being doctored up and stored outdoors, developed large surface cracks. Not until 1950 did dependable resin-filled-catalyst combinations become available. The attractive price of fifty cents per pound of cast material plus the fact that unskilled labor could be used in the tooling process caused phenolic to replace both ferrous and nonferrous metals in many applications. The greatest bulk of material went into the production of stretch blocks, replacing Kirksite, *Fig.* 2. A cast-to-size plastic stretch block of 700 pounds is equivalent to a hand-ground Kirksite block weighing over two tons and is produced at half the cost.

When large tools are made, it is customary to utilize a low density phenolic foam core to limit the inherent exothermic heat with its resultant shrink. The foam core, which weighs roughly one-fifth as much as the casting material, saves many pounds of phenolic and reduces over-all weight.

Large stretch forms are made with a boiler plate base to which structural steel I-beams are welded. To fill up the volume and tie the steel base to the phenolic shell, phenolic foam is used.

Cast phenolics have certain inherent properties that limit their usefulness. The catalyst used in curing the resin is generally acidic, so much, if unprotected metals are left in contact with the casting, rapid corrosion ensues. This can be combatted to a certain extent by neutralizing the exterior casting surface. Eventually, however, the acid works its way out to the surface again. All contacting metal must therefore be acid-resistant and lacquer-coated.

Cast phenolics must be designed to operate in compression since their tensile strengths are low (on the order of 6000 psi). In many cases this limits their scope.

Epoxies

Within the past two years a new family of resins has appeared on the tooling horizon that promises to outperform all others. This is the epoxy. Basic-

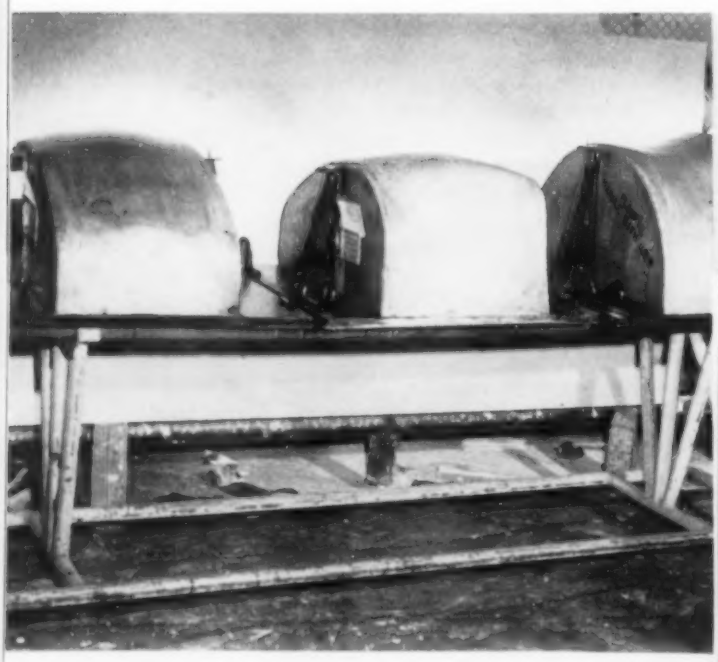
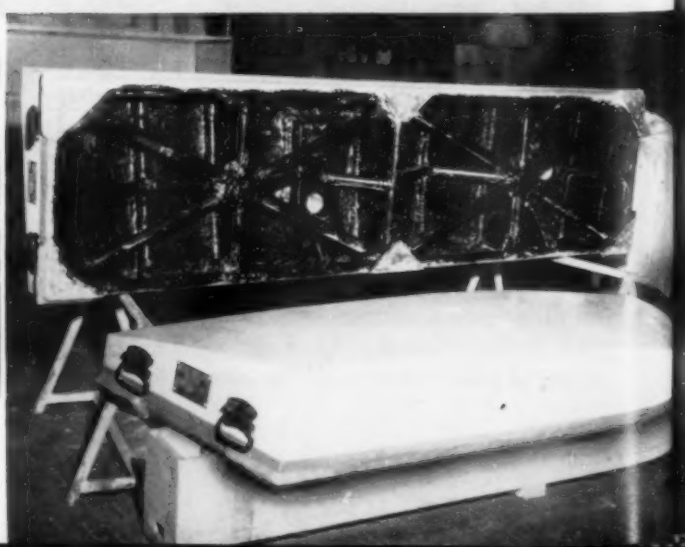


Fig. 2. (left) Typical stretch press dies are constructed of phenolic resin with foamed phelonic core on steel base plate.

Fig. 3. (below) Duplicate master of wing pylon area is constructed of glass-reinforced epoxy resin. It was molded against a plaster master to an accuracy of 0.003 inch. Underside shows tubular construction.



lly, it is a polymer of epichlorohydrin and bisphenol. The plastic develops, both with and without standard reinforcement, strength properties hitherto unobtainable.

Epoxies have been in use for several years as adhesives but only recently has the price of the resin dropped enough to allow its use in tooling. Epoxies are quite versatile. They can be used as laminating resins, casting resins or bonding resins. They are generally room temperature cured but a short oven cure is recommended to develop full strength. They can be filled with a variety of materials varying from glass flocking to aluminum dust. Length of time for curing can be varied by choice of the proper catalyst. The plastic can be cured to Barcol 65 or to the bottom of the scale simply by adding the proper ingredients. Cost of epoxies can be held under $0.75 per pound for cured resin.

Large tools made with epoxy resins have been found to hold an accuracy of 0.002 inch. A duplicate master of an airplane wing pylon area made of glass cloth reinforced epoxy resin is shown *Fig.* 3. The underside of the tool indicates the hollow trussed construction. The reinforcement is 2 inches OD, $\frac{1}{8}$-inch wall, paper base phenolic tubing. When suspended from its ends the center sag of this tool was less than 0.001 inch. One of the prime advantages of all plastic tooling is lightweight. The 240-pound tool that two men can lift replaced a 3,100-pound Kirksite equivalent that was mounted to a special 1,000-pound dolly, needed to prevent it from sagging $\frac{3}{8}$-inch under its own weight.

Checking tools of all sorts are good applications for the epoxies. Lack of shrink in curing allows the epoxies to be molded directly against any configuration. Since no heat is required for cure and the exothermic heat generated by the material itself can be controlled by layup techniques, fear of warpage in curing is virtually eliminated. A contour-trim hole-location checking fixture, *Fig.* 4, was made directly against a master to an accuracy of 0.003 inch. The bushings were emplaced by drilling oversize holes in the correct areas, mounting the bushings on pins protruding from the master hole bushings and pouring epoxy resin around the hole. The hole locating accuracy obtained in this manner is ± 0.005 inch between any two holes on the fixture.

Another type of checking fixture for checking large compound curvatures can be quickly, cheaply and accurately made of epoxy laminates. The type is illustrated in *Fig.* 5. This twelve-foot fixture was needed quickly as a shop aid to coordinate mating of various external assemblies in the cockpit and turtledeck area. The tool took fifty man hours to build and was made directly on the plaster master on which it rested. Weight was only 75 lb.

Tool designers are finding many new applications for plastics in tooling. Work currently under way includes large assembly fixtures utilizing 3 and 6-inch OD plaster reinforcing pipe. Master fixtures are being made utilizing instead of plaster a thixotropic epoxy which can be "wiped-in" between templates. These masters are virtually indestructible. They can be stored outdoors in any weather without deterioration.

Recently a different technique has been developed for fixing bushings. A knurled bushing is coated with a thixotropic epoxy resin and press fitted into an 0.005 inch undersize hole. The resin in curing bonds the bushing securely in place. Although this method is more rapid, accuracy is sacrificed.

Application to stretch press forms has taken place in the past two years. An epoxy laminate shell filled with a foamed phenolic core is made as quickly, cheaply and more accurately than the phenolic type, without an oven cure. The foamed phenolic core is eliminated. Since stresses on most stretch forms are located in a few easily predetermined areas, it was found that a hollow shell, reinforced in stressed areas will give satisfactory service.

For certain special applications flexibility is required without excessive sacrifice of strength. Nesting fixtures can be made where the nesting surface is rubbery, allowing a plus tolerance, while the normal, hard surface is one sixteenth of an inch or less into the tool face. This surface can be secured by adding the proper ingredients to the face resin when it is applied.

Fig. 4. Lightweight plastic contour checking fixture is used to coordinate cockpit and turtle-deck areas. It was built directly on the master.

Application considerations

While plastics are revolutionizing ideas of tooling, careful consideration must be given to each proposed application. Several general rules serve as a guide in determining whether to make a tool in plastic or metal and also, if plastic is chosen, which plastic to use. The following categories of tools can be considered for fabrication in plastic: drill fixtures, assembly fixtures, checking fixtures, welding fixtures, routing fixtures, trim fixtures, master fixtures, master forms, stretch forms, press blocks, Keller patterns, drop hammer dies, form dies and draw dies.

Any but the simplest tools can probably be made of plastic in less time and at lower cost than the metal equivalent. It should be remembered, however, that plastic tools are almost always molded against another tool.

If contours are involved in a tool, plastics will almost invariably be chosen since it is easier to mold a contour than to grind one. If the fixture is large (over 15 feet) plastics probably would not be used alone, if at all. Should the tool contain thin sections of $\frac{1}{8}$ inch or less, plastics should be avoided unless a metal plate can be molded in for the thin section.

When the continuous service temperature of a tool exceeds 160 F, it should not be made of plastics because the rate of creep increases rapidly with temperature. In wet areas, even acid and alkali moisture, plastics hold up better than metals. If excessively rough handling is to be expected in the use of the tool, however, metal protecting strips should be molded in. If this is impossible, plastics should not be used.

In general, equivalent accuracy can be maintained for plastic and metal tools. Only in the case of contours does the accuracy of the plastic tool surpass the metal one. Almost invariably, a plastic tool will be lighter than a metal equivalent. Where the tool must be portable, the plastic tool will invariably be chosen. Metal tools will be, for a given design, more rigid than plastic equivalents. It is frequently possible, however, to design greater rigidity into the plastic tool by use of deeper sections.

Where surface hardness is important, plastics are rarely used. A Barcol hardness of 65, roughly equivalent to aluminum, is the best to be expected. The plastic can be molded with metallic particles as a filler to increase the abrasion resistance of the tool but not its surface hardness.

Plastic tools lend themselves to quick and simple alterations without distortions which accompany metal-welding alteration. Plastics are often used to replace metal tools containing a scarce or strategic component (Kirksite, over 93% zinc). Where a number of duplicate tools of any sort must be made, plastics afford an economic advantage.

After determining that it will be advantageous to make a certain tool of plastics, the question arises as to which plastic to use. The following can be used as a guide:

Small Hand Manipulated Tools: For small tools that must withstand a moderate amount of handling abuse (i.e., drill racks, routing fixtures), reinforced plastics can be used. Glass cloth or mat with a polyester, phenolic or epoxy resin is suggested. Metal inserts and rubbing strips should be used as previously discussed. For small tools that are relatively stationary and not subjected to abuse (checking fixtures, welding fixtures, assembly fixtures) cast phenolics or epoxies can be used. Phenolics are much cheaper and more heat resistant than the epoxies, although of less strength.

Large Hand Manipulated Tools: Glass cloth epoxy resin laminates are used almost exclusively for this purpose because of accuracy, ease of fabrication and strength. Typical examples are large drill racks, assembly fixtures and checking fixtures. Paper-base phenolic tubing can be used for structural build-up. Metal inserts should be used where necessary.

Large Stationary Tools: For large master forms, Keller patterns and stretch forms either cast phenolic or glass cloth-epoxy resin construction is satisfactory. The necessity of oven curing the former makes it less desirable. For large fixed tools of other types, the glass-epoxy laminating process should be utilized.

Plastic tooling is in its infancy. In its present state of development it accounts for less than five percent of total tooling at Republic Aviation. If it continues to develop at its current rate, however, in ten years it will account for twenty percent.

Fig. 5. Combination contour-trim fixture is made of epoxy resin reinforced with glass cloth. Weight of the fixture is only 35 pounds.

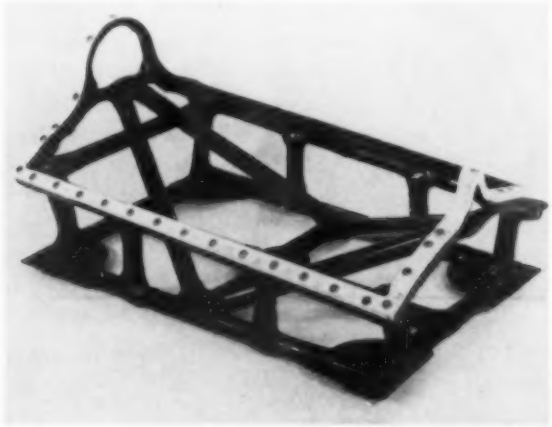


Fig. 1. Air gage inspection of jet turbine blades. Critical dimensions and conditions of blade are checked simultaneously. Air instrument floats, above, give immediate readings. Fig. 2 shows detail.

new AIR GAGING techniques

By W. I. Wilt and H. Klefaber

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PROGRESS IN THE FIELD of air-gage measuring has been great, and the future promises even larger strides. Pneumatic gaging methods are continuously being developed to divide the inch into smaller segments, thereby producing more and better products at lower costs.

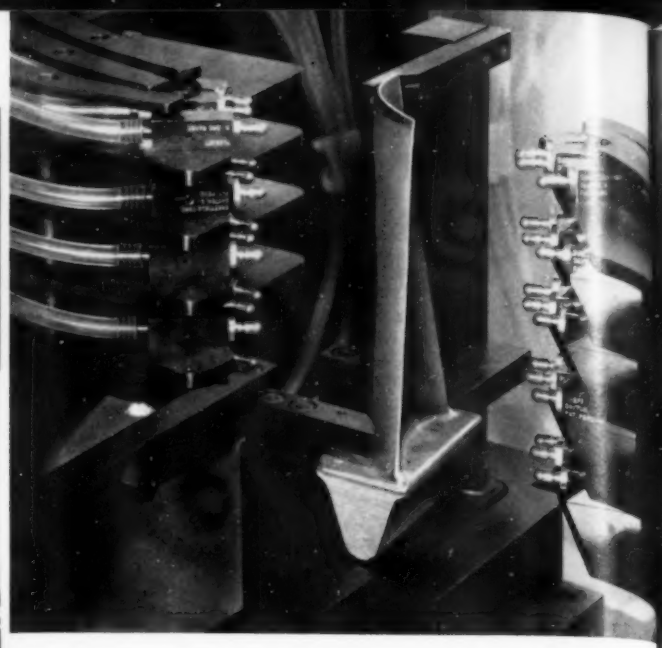
Actual dividing of the inch has been achieved largely through the development of means for amplifying small dimensional variations. These developments in modern measuring instruments can be classified into mechanical, electrical, electronic, optical and pneumatic systems of amplification, or combinations of these.

One rather recent method, multiple gaging of the indicating type, is defined as simultaneous inspection of two or more dimensions on one part. Thirty or more dimensions can be checked in the same amount of time formerly taken for one. Multiple air gages have been found particularly efficient for inspecting complex contours on jet turbine blades, *Figs.* 1 and 2. A glance at the floats on the indicator column reveals to the inspector dimensional quality of air foil such as blade thickness, root form center, direction and amount of root center, and extent of left and right lean. Also shown is amount of deviation from the theoretically perfect. The actual size of any single dimension is shown to assist production departments in making corrections. A variety of blade sizes can be accommodated without gage alterations.

Multiple gaging need not be confined to small parts. It may consist of checking some dimensions simultaneously and others successively in a series of gaging operations.

Air Gaging Cartridges: Tolerance ranges necessary in multiple and single measuring gages would be limited without the development of air-gaging cartridges. Wide application fields have recently

Abstracted from paper 22T41, "Gaging Cartridges and Other Recent Developments in Air Gaging", to be presented at the 22nd ASTE Annual Meeting. Copies of the complete paper will be available from Society Headquarters.



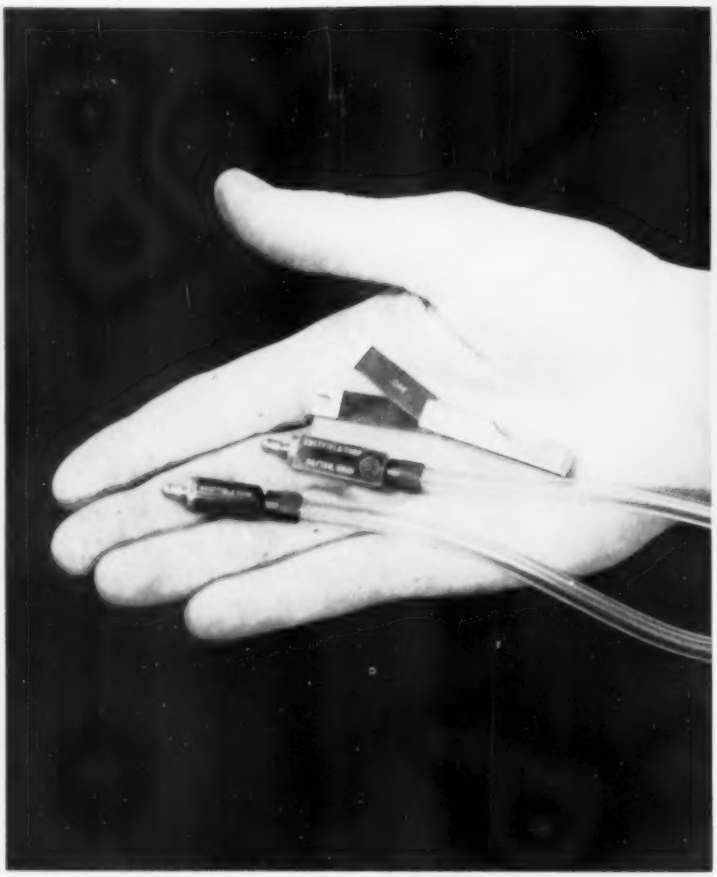


Fig. 2. (above) Close-up of jet blade inspection shows how fifteen cartridges on each side simplify a difficult inspection job.

Fig. 3. (left) Small-size cartridges solve otherwise difficult multiple air-gaging problems of complex shapes and accessibility.

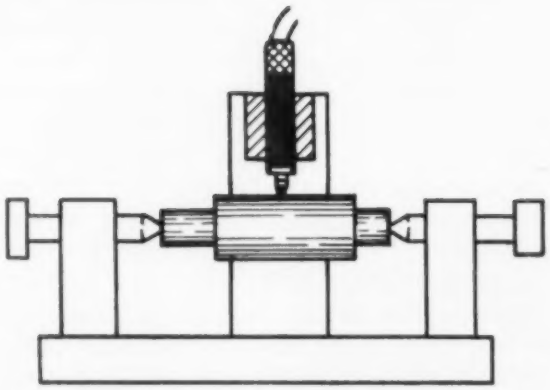


Fig. 4. Concentricity fixture uses a gaging cartridge and standard bench centers.

Fig. 5. Typical flatness application of a gaging cartridge mounted in a surface plate.

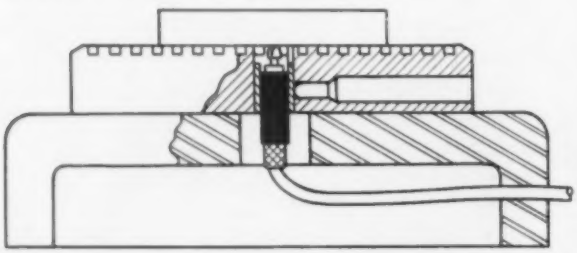
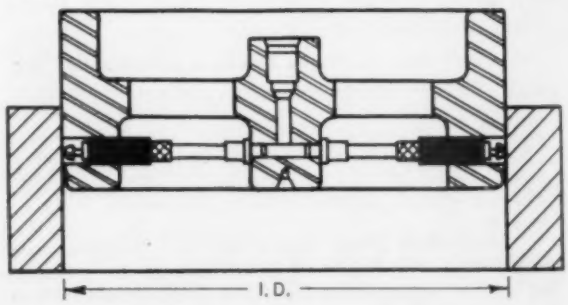


Fig. 6. Diametrically opposed gaging cartridges mounted in a plug to check a hole with 0.010 tolerance.



ɛen opened by making possible ranges from 0.001 ɪch to more than 0.100 inch.

Gaging cartridges contain a spring actuated ɹlunger which contacts the workpiece. Plungers ɯhich control air flow through an orifice have a ɪimited travel range. Air flow change is proportionɑte to plunger travel and is read directly as either ɟlow or pressure change in the air-gaging instruɯent. Sizes and shapes vary, *Fig.* 3, depending on ɑpplication. Calibration of instrument to cartridge ɪs accomplished by inserting leaf master blades, *Fig.* 3, between the plunger head and front face of the body. Cartridges are manufactured with normal or reverse air action. Normal action cartridges force the indicator float down when plunger is pushed in, showing size and condition of workpiece. Reverse flow types work in the opposite manner.

Air Cartridge Applications: Cartridges can be combined with a standard height gage and surface plate for inspecting small lot workpieces. Such use of universal tooling makes an application inexpensive. Measurement is accurate to 0.0001 inch with amplification of 5,000 to one. For rapid reading, ½ inch on the indicator column represents 0.0001 inch. Similar setups can be applied for gaging concentricity, *Fig.* 4. Tedious hand insertion of feeler gages for flatness inspection can be eliminated by employing an air cartridge. A gaging cartridge screwed into the center of a surface plate, *Fig.* 5, can be adjusted for zero reading by contacting the gaging tip with a flat master. Flatness variations of workpiece are registered on the indicator column.

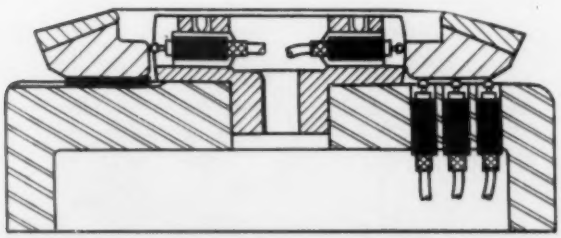
Inspection of roundness and taper in large, deep holes is possible by incorporating two wide-tolerance cartridges with an air spindle plug. A three-inch, 0.010 tolerance ID can be rapidly checked by using two diametrically opposed cartridges connected to an air gage, *Fig.* 6.

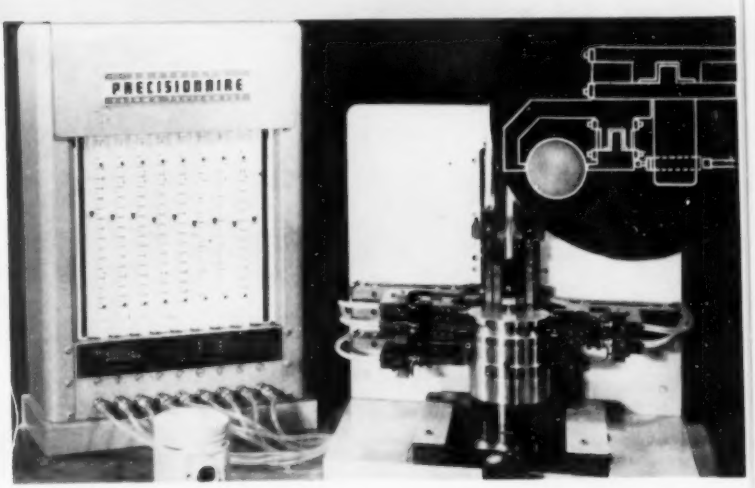
Increased uses of quality control by variables have stimulated gaging of workpieces during machining. Dial indicator type snap gages can be converted to air, *Fig.* 7, and still retain snap-gage flexibility. Magnification increases from 5,000 to one are possible. In most cases, cartridges simplify gage

Fig. 7. (lower left) Dial indicator snap gage is converted to an air snap by installing a gaging cartridge, below.

Fig. 8. (upper right) Ring gear mounted in fixture is checked for roundness and flatness. Inspection points can be ⅜ inch center-to-center without using intermediate members.

Fig. 9. (lower right) Gaging cartridges replace electrical gaging units and enable inspection of automotive pistons both by attributes and variables.





design and decrease maintenance costs. Direct application of the plunger to workpiece eliminates intermediate members necessary in mechanical dial indicators.

Multiple inspection involving fixtures is facilitated by the use of cartridges. Accuracy reducing attachments, such as levers and bellcranks, are eliminated. Flatness, concavity and convexity of ring gear mounting faces and ID can be simultaneously and rapidly checked, *Fig.* 8.

Versatility and increased inspection rates are important considerations for multiple inspection. Cartridge gage inspection of automotive pistons is an example of multi-dimension checking in limited spaces, *Fig.* 9. Height, three-ring groove widths, and five OD's are inspected concurrently. Inspection rates range from 300 to 700 pieces per hour, depending on routing methods and workpiece quality.

Gaging true OD of large workpieces is shown in *Fig.* 10. A receiver block contains two diametrically opposed cartridges located to allow approximately 0.002-inch clearance over maximum OD. Cartridges are connected to a manifold, attached to an air instrument. As the workpiece is calipered, true size is registered on the indicator columns without need for centering.

Development of the air cartridge has made possible operator control of machine slide movement by use of feed gages attached to machine tools. Feed gages show inaccuracies resulting from unequal feed screw wear. Applied to external grinders, *Fig.* 11, a gage cartridge, mounted on the wheel head slide, is actuated by contacting a fixed adjustable stop. Workpiece is rechecked for size until slide movement is great enough to allow the grinding wheel to produce the required dimension. Fixed adjustable stop is positioned at this point for succeeding workpieces. Stop is adjusted to compensate for wheel wear.

Machine Wear Indicated

Feed gages can be applied to surface grinders for machining opposing flats to 0.0001-inch tolerances on cylindrical parts, *Fig.* 12. Right-hand indicator column shows possible inaccuracies due to worn wheel slide screw. After the finish cut, table is moved to bring workpiece under the cartridge for inspection. Finish size is shown in left indicator column.

Air gaging cartridges have widened the field of pneumatic gaging. Their manufacture is not restricted to air gage makers. By use of cartridges and available information, any plant capable of designing and building dial indicator fixtures can produce air cartridge fixtures within broad limits.

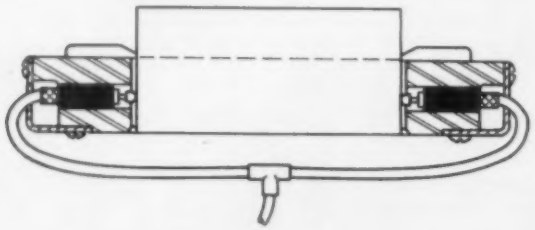


Fig. 10. Large-size workpiece inspected for true OD by two diametrically opposed gaging cartridges.

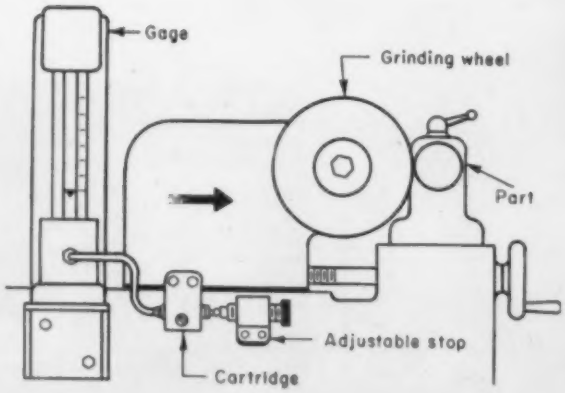
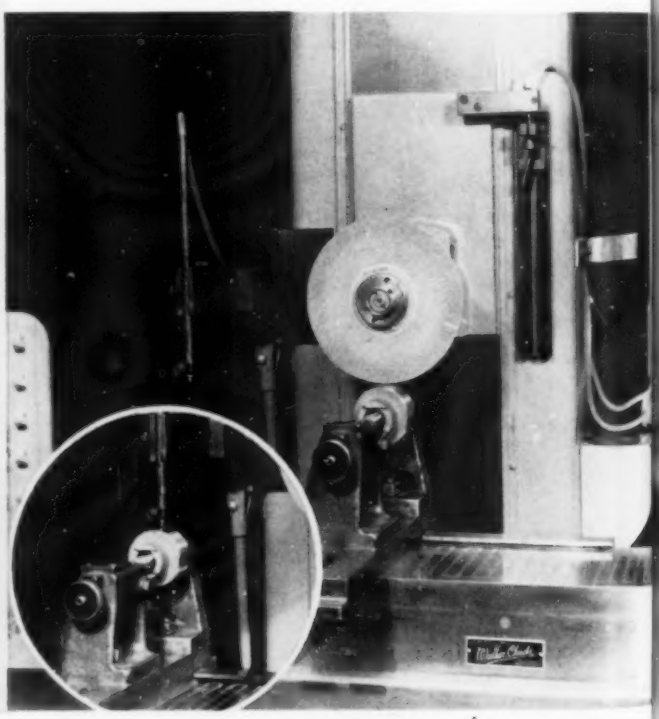


Fig. 11. Essential elements of a gaging cartridge feed gage on an external grinder. Gage regulates amount of cut.

Fig. 12. Combination feed and inspection gage utilizing gaging cartridges.



ULTRASONIC MACHINE TOOL
for cutting hard materials

By Neil Clark, Jr. and Joseph P. Aloisio

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DEVELOPMENT OF A SPECIALLY DESIGNED magnetostrictive transducer operating at 27 kilocycles has resulted in a practical application of ultrasonic energy for abrasive machining in industry. Using standard abrasives in liquid suspension, the device offers unusual advantages in cutting intricate shapes in hard and brittle materials. It makes economically feasible machining carbides, ceramics, hardened tool steels, glass, and quartz. More important applications from an engineering viewpoint have been for producing shaped drawing dies, and cutting chip breakers, carbide and hardened steel dies, ceramic spacers, stamping punches and quartz.

The ultrasonic machine tool, *Fig.* 1, offers a new approach to the old method of producing holes in hard materials by means of punch and abrasive. In the ultrasonic machine tool, the equivalent of the punch is rigidly held and accurately positioned. The shape of the punch can be complex and blows may be struck at the rate of 27,000 per second.

Electrical power generated by the electronic equipment is converted into ultrasonic energy by the transducer. The cutting tool on the end of the cone vibrates up and down parallel to the cone axis at the rate of 27 kc. With abrasive flowing between the vibrating tool and the workpiece, cutting action results when the tool is lowered on the workpiece.

Electronic Driver

Electrical power supply for the transducer consists of a conventional oscillator and power amplifier capable of 500 watts output at 27 kilocycles, *Fig.* 2. The oscillator section utilizes tubes V1 and V2 in a push-pull electron coupled circuit. The power amplifier consists of the push-pull triodes V3 and V4. Oscillator frequency is controllable in the range of 20 to 30 kc. This control is made possible by adjusting front panel controls.

The d-c polarizing supply which is part of the electronic driver supplies a bias current to the

Fig. 1. Ultrasonic machine tool consists of an electronic power supply, transducer, supporting stand, work holder and abrasive circulating system.

Abstracted from paper 22T31, "An Ultrasonic Machine Tool," to be presented at the 22nd ASTE Annual Meeting. Copies of the complete paper will be available from Society Headquarters.

transducer. This bias current adjusts the amplitude to control the rate of penetration in any given material. The control for this bias current is also located on the front panel.

The electronic driver has been designed to operate on a 110-v single phase 60-cycle line. At full power it draws approximately 15 amp a-c. The input under these conditions is approximately 1.5 kw.

Transducer

In the transducer, the electrical output of the electronic driver is converted into mechanical motion. Tool cones are attached below a support flange. The stack (source of mechanical energy) is composed of a pile of pure nickel laminations free at one end and brazed to the transmitting cone at the other, *Fig.* 3. A cylindrical, water-tight cover is bolted on at the outer edges of the support flange. During operation, considerable heat is developed by magnetic and mechanical hysteresis losses. Cooling is effected by a water spray which drains from the bottom.

Function of the transducer depends on magnetostriction, the property of certain materials to change in length with varying flux densities. As the current is increased through a coil of wire wrapped around a magnetostrictive rod, the flux density in the rod increases. This causes it to shorten in length. Electrical energy in the form of current through a magnetostrictive coil is only partly stored in the magnetic field; part is stored in the mechanical stress of the bar. Mechanical vibrations set up in a bar by alternating current react back on the alternating current and modify it.

An important criterion in the choice of magnetostrictive materials is the relative amount of energy stored in mechanical form as compared with the total electrical energy input. For nickel, this figure is about 25 percent, which is extremely good compared with other metals at relatively low flux densities. For this reason nickel is used in the transducer stack.

After ultrasonic mechanical motion has been generated by the nickel stack, some means must be used to couple the ultrasonic energy efficiently to the workpiece and hold the assembly securely without materially damping the vibrations. How this is accomplished in the ultrasonic machine tool transducer is shown in *Fig.* 4.

If first the stack alone is considered, vibrating at its natural resonant frequency with no external force, the center of gravity does not move relative to the reference, but the two ends do. To do this, the two ends must, of course, move out of phase. The relative motion is plotted just to the right of the mechanical assembly. The vertical coordinate corresponds to distance along the axis of the mechanical assembly and the horizontal coordinate represents longitudinal displacement amplitude. Right of the zero line corresponds to displacements up; left, to displacements down.

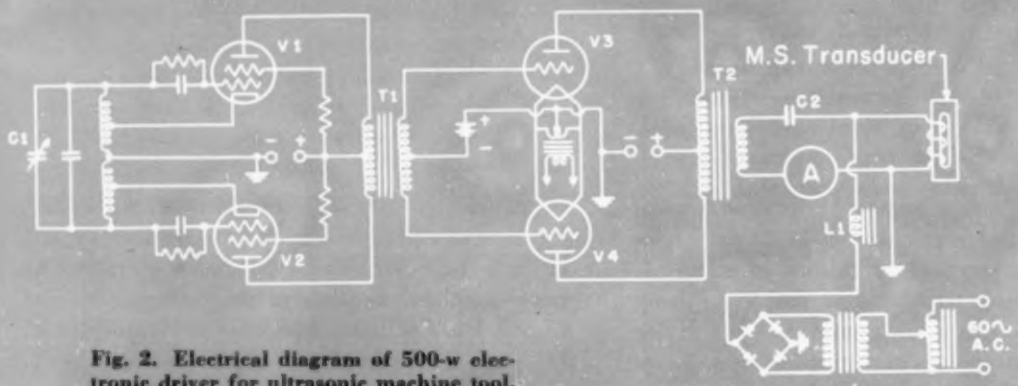


Fig. 2. Electrical diagram of 500-w electronic driver for ultrasonic machine tool.

Adequate support for transducers has always been a major problem. A satisfactory solution has been devised for this ultrasonic machine tool transducer. It consists of a quarter-wave stub support. The cylinder and flange brazed to the top of the transmitting cone, *Fig* 3, is ¼ wave in length. As shown in *Fig.* 4, the top section of the support is vibrating at the same amplitude as the nickel stack; at the bolt circle, where the transducer assembly is mounted, the vibration amplitude is minimum. Thus, a negligible amount of ultrasonic energy is lost to the support even though the latter is very rigid.

Mechanical Transformers

For effective cutting, it is desirable to use as much of the ultrasonic energy as possible in remov-

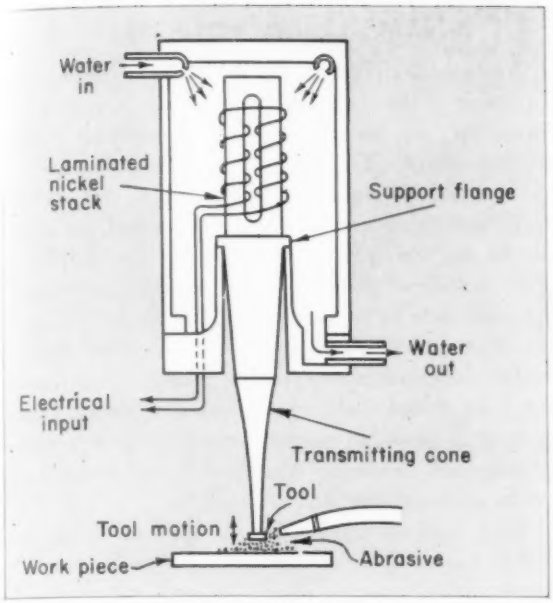


Fig. 3. Electromechanical transducer assembly.

ing material. Studies have shown that to do this as large an amplitude as possible must be present in the cutting tool.

The magnetostrictive transducer used in the ultrasonic machine tool is capable of supplying large forces but at relatively small amplitudes. Since the cutting load requires small forces at large amplitudes, it is necessary to have some kind of transformer between the magnetostrictive transducer, nickel stack, and the cutting tool. This transformer must convert the energy available at the transducer to a form in which it can be readily used. The transformer used takes the form of a solid metal rod connected at one end to the transducer and at the other end to the cutting tip. The amplitude of vibration is now a function of the diameter of the rod. The smaller the diameter, the larger the amplitude. This means that in operation the larger end of the rod is connected to the transducer and the smaller end to the cutting tool.

For the ultrasonic machine tool, it is necessary for reasons previously stated to operate the transformer at resonance. This means the physical length of the transformer rod or cone is somewhat critical. It also means that the manner in which the diameters change is somewhat critical. For optimum operation, the cross-sectional area of the tool cone at which the toop tip is attached should match the cross-sectional area of the tool tip itself. Since amplitude is one of the factors determining the rate of material removal, it can be concluded that the rate of material removal will increase as the area of the hole being drilled decreases. Likewise, since the amplitude decreases as the cross-sectional area of the tool tip increases, it can be concluded that a limit exists in the maximum area that can be accommodated by the present model.

This limit in maximum area varies with the work material, that is, a larger area can be accommodated in glass than in tungsten carbide. In general, the limit in maximum area is approximately 1½ square inches.

It has been stated that the nickel stack, the driver cone, and the tool cone are all resonant ½-wave lengths designed to give maximum amplitude when tuned to the transducer frequency. Adding a tool tip increases the length of the tool cone such that its resonant frequency decreases. For optimum operation, the recommended procedure is to reduce the length of the tool cone such that the tool cone plus tool tip are properly tuned at transducer frequequency.

The material normally used for tool tips has greater losses than the cone material. This means that the over-all efficiency of the tool cone and tool tip decreases as the length of the tool tip increases. This may impose a practical limit, but, because of the number of variables involved, it cannot be clearly stated. For example, the limit may not be imposed by the length of the tool tip added but rather by the rigidity of the tool or the ability of the abrasive to reach cutting surface.

Abrasive

In operation, an abrasive transported in some vehicle such as water is made to flow between the vibrating tool and the workpiece. The type of

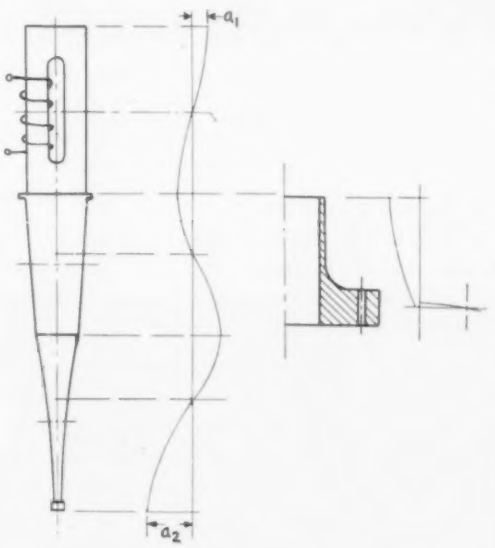


Fig. 4. Relative vibration amplitudes in ultrasonic machine tool transducer.

abrasive, the mixture of abrasive, and the manner in which the abrasive is made available to the cutting surface are all important factors in effective cutting.

Boron carbide, silicon carbide, and aluminum oxide are commonly used. These abrasives, which are relatively inexpensive, are used in grit sizes ranging from 180 to 600 depending on the requirements of the particular application. In diameter, these abrasives vary between 0.00033 to 0.0034 inch. Tests which correlate the type and size abrasive for maximum cutting rate in any given material are incomplete. In general, however, it has been established that the cutting rate of most materials increases as the grit size increases and that the harder the abrasive the higher the cutting rate. It has also been observed that the surface finish varies inversely with the grit size. Surface finishes with this method of machining have been measured at between 10 and 15 microinches, rms

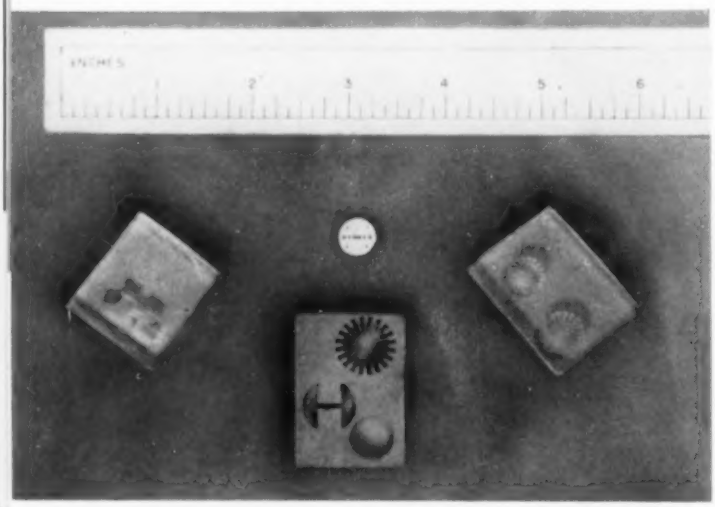


Fig. 5. Complex holes drilled in various difficult-to-machine material by use of ultrasonic device. Carbide (bottom center) shows typical shapes that can be cut.

when using a 600 abrasive.

A fresh flow of abrasive must be available under the tool tip at all times. The techniques for accomplishing this vary considerably with the process being performed. In cored materials, it is recommended that abrasive be forced up from the bottom as well as having a stream directed at the cutting surface. In a trepanning operation, it is suggested that abrasive be applied both inside and outside the cutting tool. In applications where neither of these techniques is possible, a steady flow of abrasive can be maintained on the surface being cut by periodically removing the tool and permitting a stream of fresh abrasive to flush out any abrasive that might be trapped in the cavity being drilled.

Cutting Procedure

An outstanding advantage of this machining principle is the simplicity of the tools required because they are merely the male counterpart of the desired shape. Even the most complex cavity in the hardest of materials represents a straightforward tooling operation. In *Fig.* 5, several materials are shown which have been drilled. The shapes of these holes and cavities would suggest considerable difficulty even in the softest of materials by standard machining methods.

The materials most frequently used for tool tips are cold rolled and unhardened tool steel. These materials based on present data represent a compromise in maximum cutting rate, minimum tool wear, machinability and availability.

Tool wear encountered with each of these materials varies considerably with the type of material being drilled and the amount of material removed. In glass, the ratio of depth of cut to tool wear is as high as 50 to 1. In tungsten carbide, it may be only 10 to 1 or as low as 1 to 1. Tool wear plus the fact that some side lapping results from the feed of abrasive down between the tool and workpiece requires that certain procedures be followed if high accuracis are to be maintained.

Working with cored materials offers several advantages not only in that a fresh supply of abrasive can be maintained, but also in that it reduces the amount of material to be removed. Its use is recommended whenever possible.

In applications where a large amount of material is to be removed, it is necessary to use several tools. In drilling the intricate hole as shown in *Fig.* 5, two tools, which were the male of the shape shown, were used in completing the operation. One of these tools was used in removing the bulk of the material and the other for sizing and finishing. Side lapping is compensated for by undersizing the tool used for roughing. Undersizing should be in the order of 0.01 to 0.025 inch. If several roughing tools are used, undersizing should be progressively smaller. Tool wear is compensated for by using an accurately dimensioned tool for final sizing. Where a large amount of material is to be removed or extremely high accuracies are required, several undersized roughing tools should be used before final sizing. With this method, accuracies of 0.0002 inch have been obtained in blanking and shaped wire drawing dies which were fabricated from tungsten carbide.

This method of machining is applicable to many uses. Its ability to form shaped holes in either conductive or nonductive hard materials has stimulated studies toward the solution of problems in a host of industries. Initiative has in most instances been with the industry itself.

making modernization dynamic

By John W. Greve

Editor

The Yale & Towne Mfg. Co. is representative of the many outstanding plants that will be visited by tool engineers in the plant-tour program scheduled for the forthcoming ASTE Annual Convention in Philadelphia. This article, as a plant tour in print, describes some of the interesting manufacturing operations that will be seen by the visitors and discusses the company's philosophy behind these operations.

IMPLEMENTING A LONG-RANGE manufacturing plan, management of the Yale & Towne Mfg. Co., Philadelphia, has embarked on an extensive program involving the addition of $5 million in equipment to its manufacturing facilities during the past year. This dynamic modernization program is the result of a careful study and is estimated to effect savings in operations during one year to equal the investment in equipment.

Modern, judged by accepted job-shop standards, this four-year-old plant is a single story building with 775,000 square feet of floor space. During the first year of its operation, using the same facilities that had been employed previously in five multistory buildings, the savings effected in materials handling costs alone amounted to more than $1\frac{1}{4}$ million in the production of $25 million sales

Fig. 1. Lathe especially built for machining banjo housings for industrial trucks. This machine, in one operation, turns all diameters on both ends of the drive-axle housing. This reduces machining costs by 35 percent over previous methods involving three machines.

volume of hoists and industrial trucks. This was the estimated capacity of the plant yet, in the second year of operation, the sales volume was doubled with the same facilities.

Savings resulting from the new manufacturing plan will be possible because larger job lots can be produced on higher capacity standard and special machines and because more components will be built at the plant instead of subcontracted. In expanding the facilities, consideration was given to the wide diversification of product models and changes occasioned by product improvements.

For these reasons, a high degree of flexibility is essential in the machine tools so that they can be adapated readily to changing needs. Some parts, such as differential axle housings and trailing axle housings for industrial trucks in which the possibility of design changes is remote, will be machined on special-purpose machines, such as shown in *Fig.* 1, especially if the machining cycles are lengthy and involved. Such operations, however, involve only a small percentage of the machine tools. About 75 percent are standard tool, *Figs.* 2 and 3, for flexible operation and quick adaption to setup changes.

Policy in buying this new equipment was to purchase the same make and model of existing equipment, consistent with modernization and performance of the machines. This was done so that any job could be run on standard time values, giving the same control values to any machine on which a job could be performed. As an indication of the production machines involved in this new program, the following have been installed during the past year or are in process of being installed:

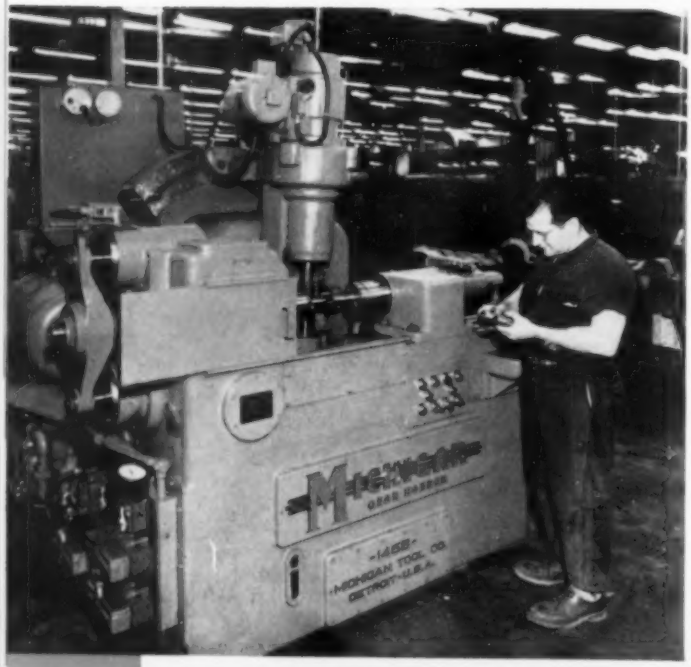


Fig. 2. (left) High-speed hobber is tooled for 54 gears. Three of these machines produce gears for industrial truck transmissions, and drive units for power hand trucks and hoists. Machine is manually loaded and has automatic clamping.

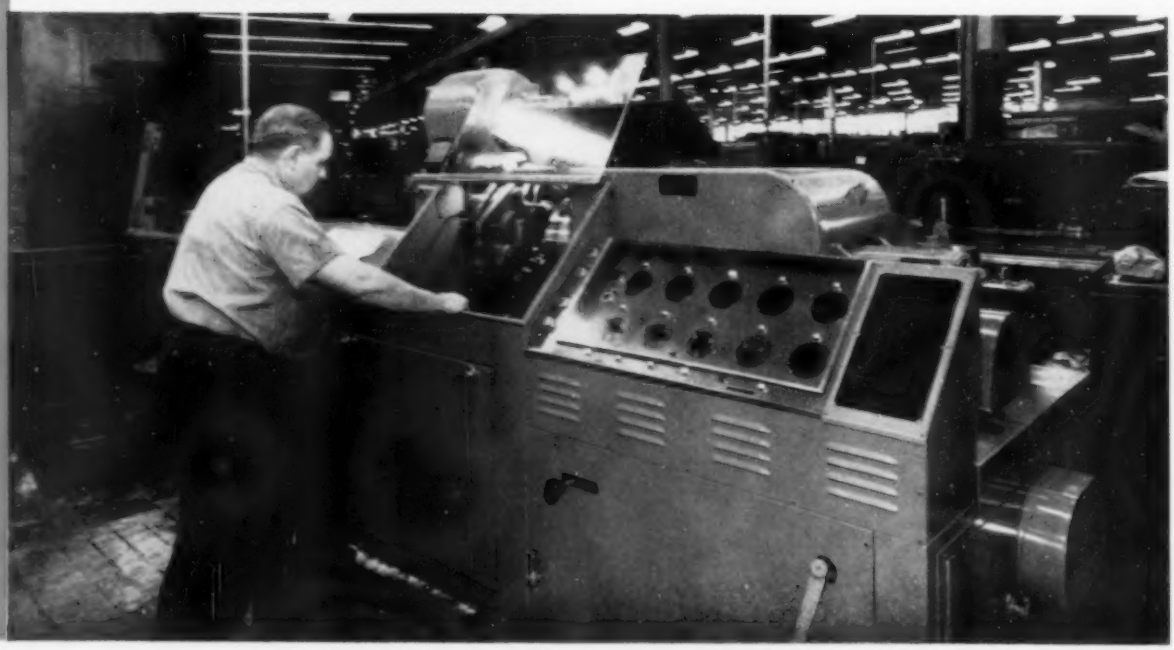


Fig. 3. (below) Single-spindle automatic is used to machine small shafts, bushings having complicated grooves for trailing axles, etc. Machine warns operator if parts are not within tolerance.

3 High-speed gear hobbers having tooling for 54 parts
13 Bullard Cutmasters with automatic cycle
18 Radial drills
2 Single-spindle chucking machines
2 Single-spindle automatics, 2½ inch
2 Multiple drilling and tapping machines with transfer table to drill and tap in one operation
2 Drilling machines
1 Shear, 1″ x 12′ capacity
3 Flame-cutting machines equipped with 8 torches and electronic tracer
1 Horizontal mill, 120 inch
1 Jig mill, 72″ horizontal and 48″ vertical travel
1 Boring machine
1 Hydraulic press, 800 ton, 84″ x 60″
1 Wrapping roll for making wheels

10 Milling machines.

In the heat-treating department the following equipment has been installed:

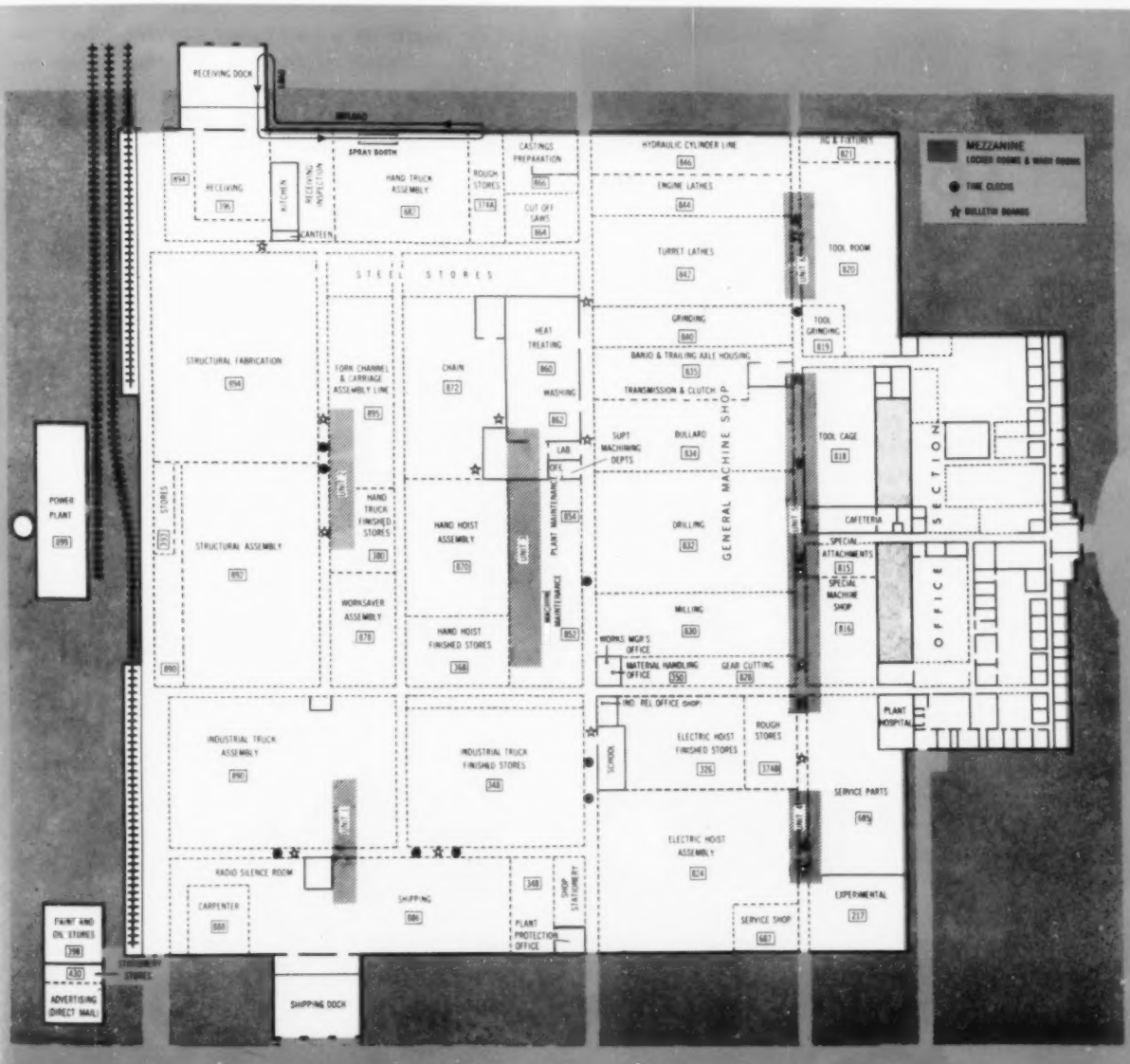
1 Car type furnace
1 Homocarb furnace
1 Homotempering furnace
2 Salt bath furnaces
2 Oven furnaces
1 Sandblast table machine
1 Straightening press.

To provide for the additional work and maintenance in the toolroom the following additional equipment has been installed in that department:

1 Radial drill, 5′
3 Lathes
1 Hydraulic universal grinder, 12″ x 36″
1 Surface grinder, #5
1 Milling machine, #3
1 Sensitive drilling machine
1 Combination chip breaker and diamond finishing grinder.

Plant Layout: Because plant layout is changed on occasion to improve methods or material flow or to provide for a change in processes or design, the layout changes are planned on a plastic sheet

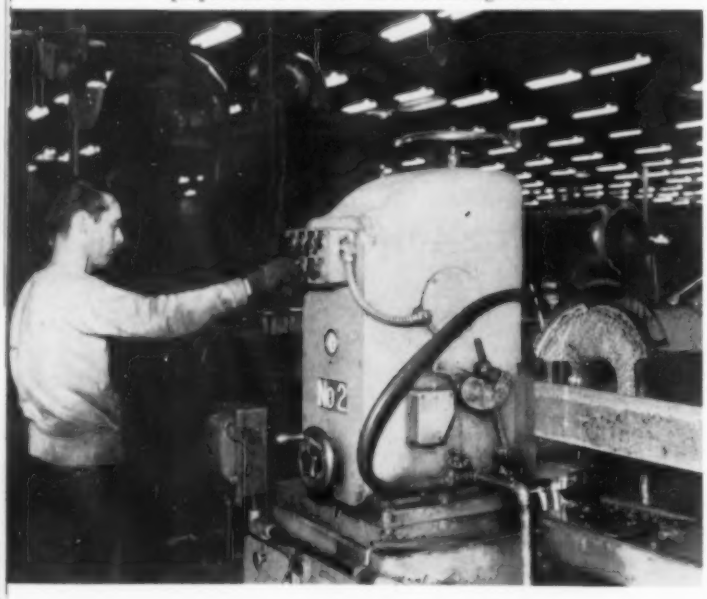
Fig. 4. Simplified plant layout showing arrangement of production and assembly areas.



with ¼-inch grids representing foot squares. Plan views of all machines and equipment, having the same scale and adhesive backs, are located in position on this grid. Walls, aisles, posts, etc. are also shown in position. As changes are made, prints of the new layout are quickly supplied to interested departments and plant foremen. In this way everyone is not only kept informed but also made layout conscious.

Materials are delivered to a single area as shown in the simplified layoutout plan in *Fig.* 4. They

Fig. 5. Cutoff saw for bar and channel stock used in fabricating forks; channels and carriers. Sandblast equipment is visible in left background.



are stored in raw stores, steel stores, or outside the plant after prime painting. Each machining department has a temporary storage area. As parts are machined, they are placed in an outgoing area for transporting to the next machining operation, heat treating or finished stores. When parts reach finished stores, they are segregated for assembly and sent to the assembly department in sets. Machining departments are arranged for each major type of machine tool. This method requires considerable paper work in the form of operation schedules, tool records and instruction sheets, but increases the efficiency of machining operations and utilization of equipment. This method also increases the difficulty of expediting parts and necessitates strengthening quality control.

Painting: Castings are all painted before storing out-of-doors. The new spray booth has an opening at each end through which passes a monorail system having a 595-foot circuit. Castings are loaded at the receiving station and travel through the booth for painting, through an air drying section and to an outdoor unloading station.

Previously, the castings were trucked to the paint booth, loaded and unloaded on a conveyor, and trucked back to storage. The new conveyorized system eliminates considerable handling, requiring only loading from receiving and unloading at storage. The painting time remains the same but the operators have no handling duties other than required by spray painting.

The former method of painting cost about $3 per ton of castings. The present method is estimated to cost ⅓ as much. With an estimated 35 tons of castings being painted daily, the savings will amount to over $21,000 annually.

Fork Lines: Of particular interest are the new production lines for forks, channels and carriers for the industrial lift trucks. Although these components are relatively simple in construction, they are ideal for straight-line production. Bar stock is cut to length by a heavy-duty circular cutoff saw, *Fig.* 5. Adjacent to the saw is a sand blast machine for cleaning the cut lengths. The workpiece then goes into a specially designed gas-fired oven to heat the midsection to a cherry red for forming. There are two identical furnaces so that one bar is always being heated in a timed cycle while a heated one is being formed in a bending machine. This operation makes a 90-degree bend in the fork in two passes of the plunger.

In the next operation, a horizontal milling machine tapers the bottom of the fork nose, making a long or short taper depending on whether the design is a chisel or standard fork. The radius on the nose is then flame cut by a torch guided by a magnetic head and template. Adjacent to the roller conveyors on which the forks travel are two welding stations where the fork-block and hanger forgings are manually located in fixtures and welded in position with an a-c welder.

These fabricated forks are returned to a conveyor feeding a roller-hearth furnace for heat treating. As the forks reach the end of the furnace they touch wires extending in the furnace, signalling the operator. Beyond the furnace is an elevator section in the conveyor. Depending on the treatment desired the operator lowers this section into an oil quench or continues the parts along the conveyor to water quench. After heat treating the forks are sandblasted, straightened in a press, painted and shipped to stores.

The channels and carriers are produced on lines similar to the fork line. After being sawed to

length, the members are cleaned by sandblasting and painted with Protectometal to prevent weld spatter from adhering, simplifying cleaning the subassemblies. The members are straightened and then drilled in jigs. After being drilled, they are placed in fixtures for welding of cross members and attachments. The next operations involve press straightening with the aid of gages and heat treating.

Structural Members: Frames and attachments for the trucks are fabricated from bar, channel and plate stock. Blanking, forming and stamping of large members is performed on an 800-ton hydraulic press. Flame cutting of members is performed on three machines each having eight torches, controlled by an electronic tracer that follows the contour of a full-scale, black-and-white, paper template, *Fig.* 6. This control guides the torches within a few thousandths of an inch, accurately reproducing the template to make eight pieces simultaneously.

Assembly: Main frames for the trucks start on the assembly line in a vertical position with the back end sitting on a dolly, *Fig.* 7. In this position the engine, transmission, differential axle,

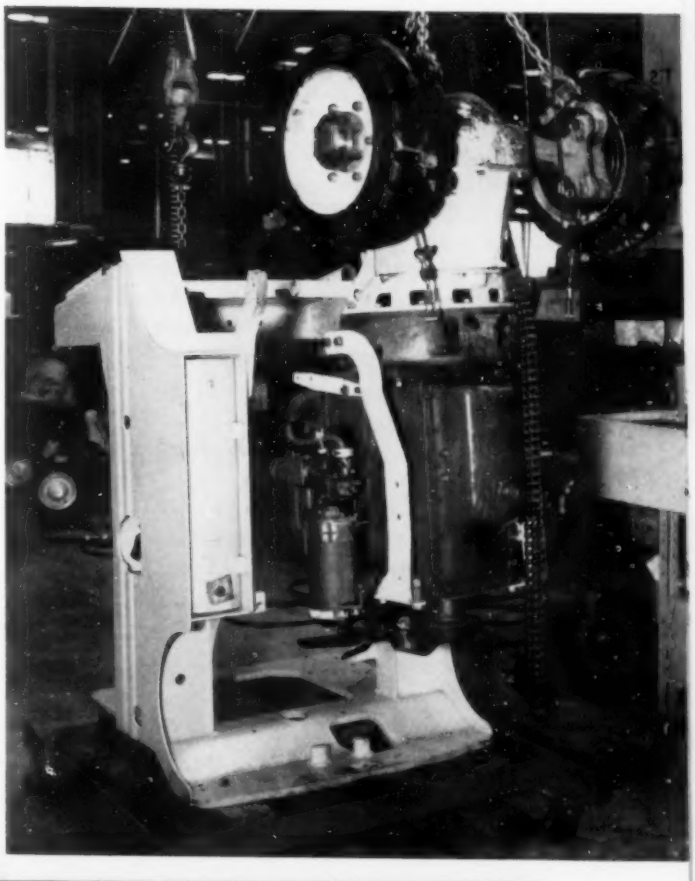
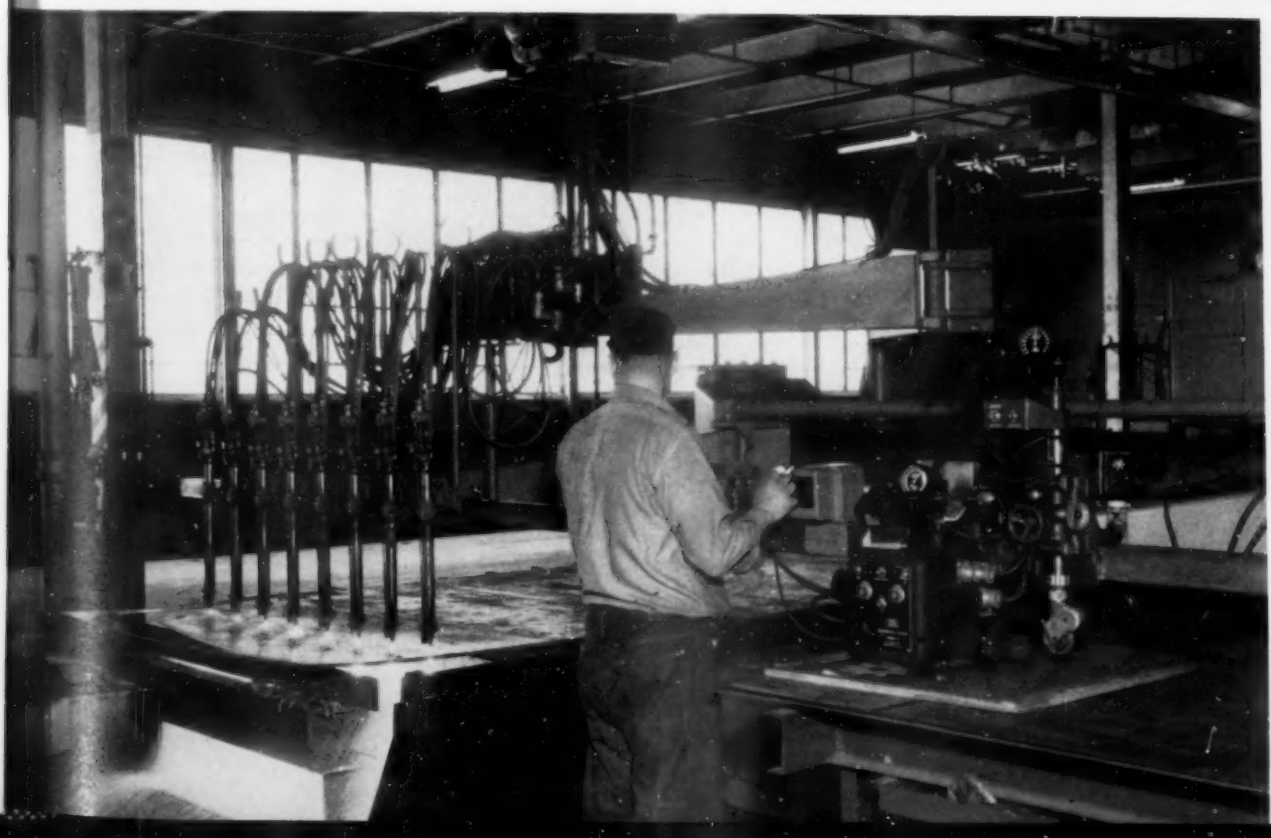


Fig. 6. (below) Multiple-torch flame-cutting machine is controlled by an electronic tracer. Template is a black silhouette on white paper.

Fig. 7. (right) Engine, transmission and drive-wheel subassembly being positioned in an upended industrial truck frame. After trailer axle and other fittings are attached, the truck is positioned on its wheels for attachment of lift assembly.



trailer axle, wheels, controls and components are attached. Hoists, attached to each end, then turn the truck to its normal position on wheels for attachment of the hoisting mechanism and remaining fittings.

Channel and cylinder subassemblies are stored, hanging by chain slings, on monorail sidings. These siding are parallel to a monorail hoist so that, as a truck reaches this section of the assembly line, the desired assembly can be selected without disturbing or rearranging any of the others. With the attachment of the lift assembly and its cylinder the truck is fitted and sent to shipping.

Hand Chains: Although not a new operation at the plant, the making of hand and load chains by precision manufacture is extremely interesting. Principles of automation have been employed in the manufacture of the hand chains inasmuch as the chain in process requires no external handling until it is ready for bundling and tumbling for bright finish.

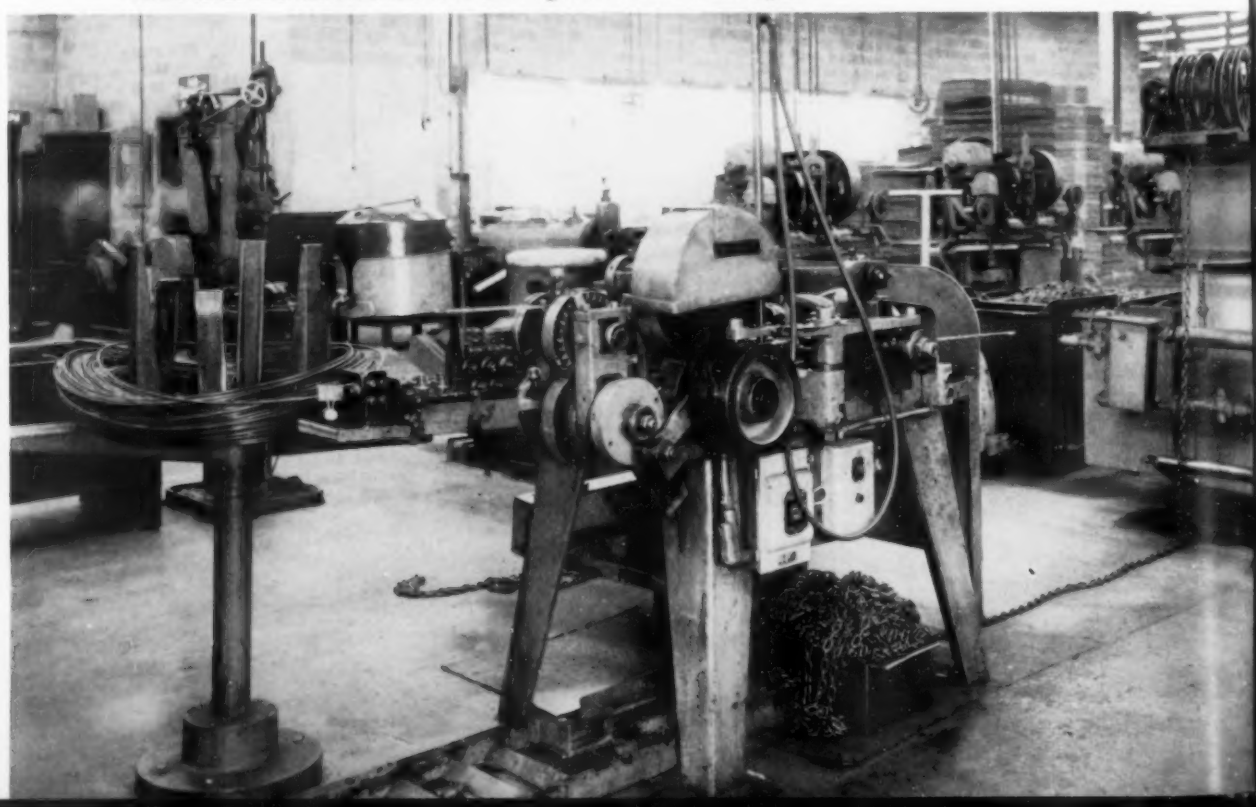
Coils of ¼-inch cold-rolled steel weighing approximately 200 pounds are loaded on a forming machine. This machine, shown in *Fig.* 8, shears the stock to link length and wraps the links around a split post, forming connected chain. As each link is formed the previous link is rotated 90 degrees, one clockwise and the next counterclockwise so that the formed chain enters each loop without twisting the chain.

After forming, the chain passes through a vapor degreaser shown at extreme right in *Fig.* 8. It then enters the first of two welders which resistance welds alternate links, *Fig.* 9 and 10. A second station in this machine has a set of dies to forge and trim the weld to size. The weld is then cooled by air blasts and an automatic sizing station checks the link length to assure that the machine is functioning properly. The second welder is a duplicate machine, welding the links skipped by the first machine.

Chain is bundled on a bundling machine to facilitate handling in the tumbling barrels. Each bundle is wired through the links in four positions—top, bottom and sides. Tumbling is done in a mixture of sawdust and steel chips to give a smooth bright finish. The chain is then given a careful visual inspection.

Load Chain: Making load chain is not as automatic as that for hand chain. Each machine in the process, however, is automatic. This chain is made of heat treatable steel alloys. Hot-rolled rod is sheared to length, within 0.005 inch; a 6-degree taper is turned on each end, and lengths are then tumbled in sawdust and steel chips. These lengths are visually inspected while being fed into a magazine feed on a link forming machine, *Fig.* 11. These machines, specially designed and built by Yale & Towne, handle rod in sizes of ¼, 9/32, 5/16, 3/8, 7/16, ½, and 9/16 inch for making the different

Fig. 8. Forming hand chain from coil material in automated chain line. Formed chain from this machine is fed to the degreaser seen at the right.



size chain for various hoist sizes.

The chain links are formed around a split post and shaped so that the open end will have excess material to allow for upsetting during welding. Between forming and feeding into the welders, the chain is cleaned in a degreaser. Like the hand chain, the load chain is welded in a battery of two machines, one for the links in each plane. Each welder has a trimming station where dies, having four stations, forge and trim the welds so that they will conform closely to the link shape. This is necessary for free operation of the chain in the sheave pockets.

Low-carbon chain is then heat treated in a special furnace having a set of rollers on which the chain is loaded during the heating cycle. The chain is held for ½ hour in the furnace at 1650 F and then cold-water quenched to normalize the weld and increase the strength of the link by 25 percent. The chain is then tumbled in sawdust and chips about four hours to remove scale and obtain a bright finish.

All load chain is made undersize so that it may be stretched to gage. The links of all sizes of chain are stretched about 3 percent to an accurate gage having pockets for each link. Each link is visually inspected. Any link with a defect is cut out and replaced by a new link. In making alloy chain the process is the same with the exception that the alloy chain is stretched to gage length previous to heat treating. An alloy chain made from $\frac{5}{16}$-inch rod has strength equivalent to that of a $\frac{3}{8}$-inch low carbon chain. Both are used for one-ton hoists, the former reducing the size and weight of the unit.

Production Control: To maintain production, all machining operations are scheduled a month in advance to meet assembly requirements. Production control is operated on the basis of product control rather than parts control. This is set up on the basis of forecasting product requirements for the

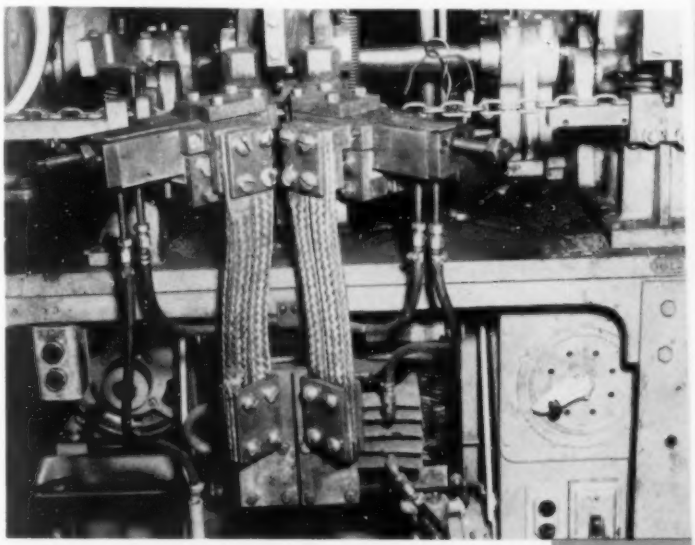
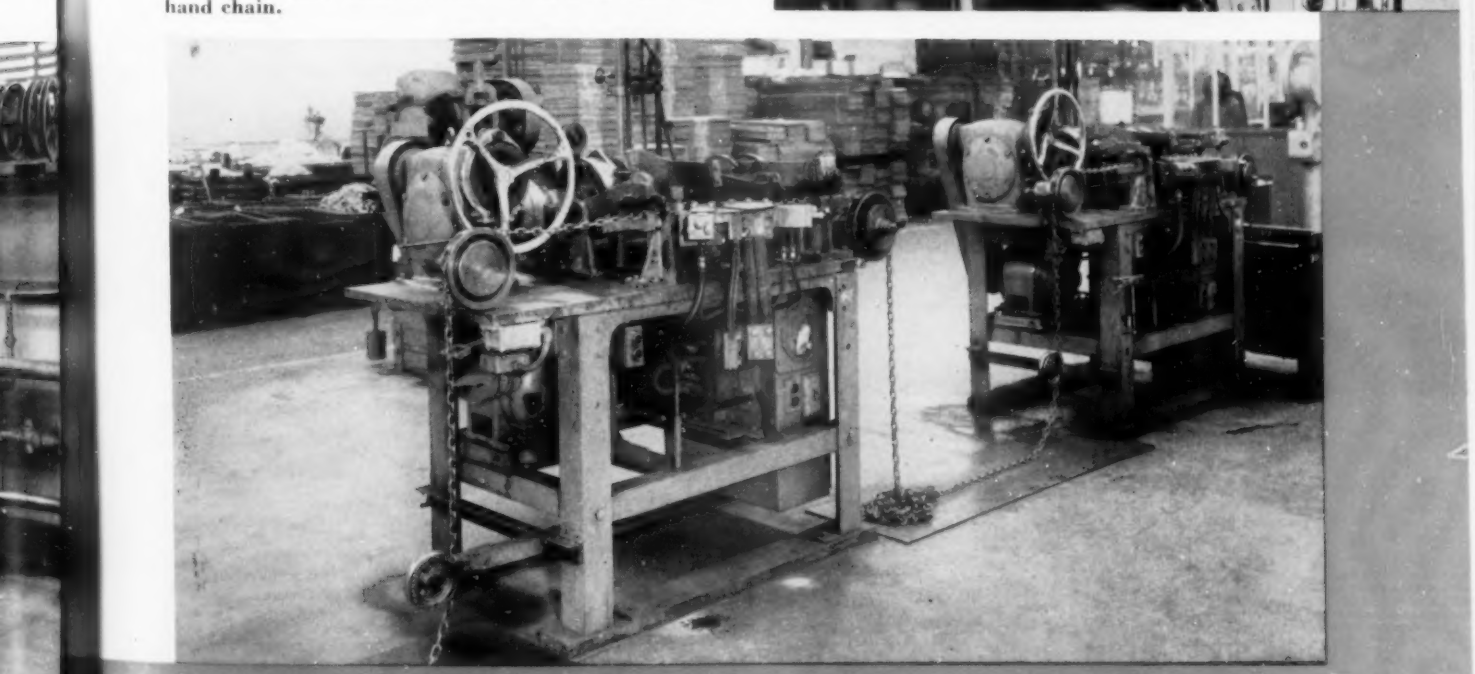


Fig. 9. (below) Two welders, one for each plane of links, complete the automatic line. These units resistance-weld each link, trim and forge the weld, cool the welds by air blast and gage the links to assure that the machines are functioning properly.

Fig. 10. (right) Close up view of welding head for hand chain.



next twelve months. A punched-card tabulating system is used for breaking down the schedule into requirements for individual parts for each month in the future. With this tabulating equipment, more facts are available faster and at a lower cost than were obtainable with previous systems.

This method of scheduling deliveries corrected the practice of assembling standard products, for which component parts were available, at the expense of some special models that might be needed more urgently. Now, specific daily and weekly assembly schedules assure assembly of the most needed models.

For a machining job, the production control department, in addition to standard papers, issues a tool record, listing all standard and special tools for a job. All gages and tools ground within tolerances, such as reamers, are numbered. Three of each tool required for a machine job are placed in the toolbox at the tool crib together with the tool record. The tool crib must fill this order within the time limit stamped on the tool record.

When an operation is completed, the supervisor checks the tools back into the box. They, together with the tool record for the second succeeding job, go back to the crib, a box for the next order being at the machine awaiting setup. In this way there is always a box in time for the next job.

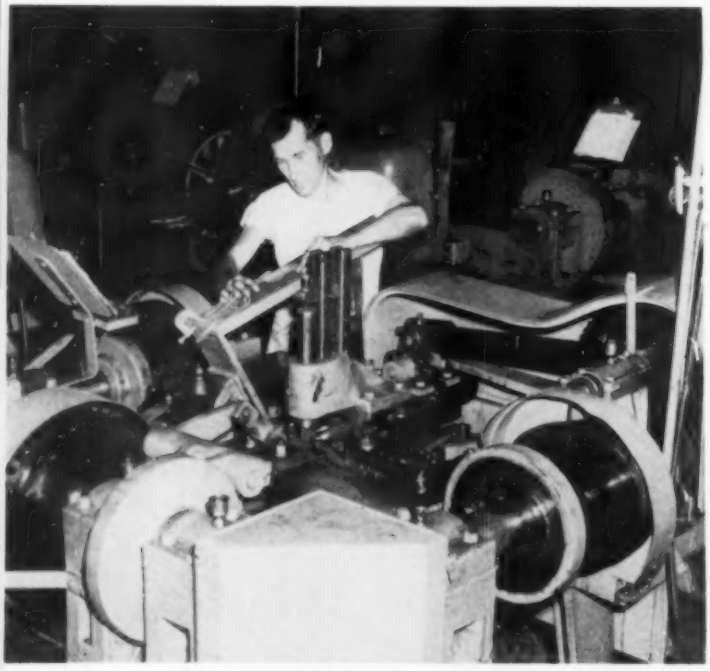


Fig. 11. Load chain forming machine is magazine fed with rod cut to link length.

If an order cannot be filled at the crib, an urgent tool request tag is put on the tool record and sent back to the dispatcher who issues the next job. It is the responsibility of the tool crib to dispatch a release order when the missing tool returns to the crib. To do this the crib keeps a copy of the order on display in the crib in order to follow the missing tool.

When a job involving a missing tool is urgent, the supervisor by contact with the supervision of both the crib and shop gets the job moving through personal attention. This may involve getting the tool from another job, rushing a repair order or improvising temporary tooling.

Because machine hours are scheduled, unnecessary delays in providing tooling would be costly, especially when a machine is scheduled for 80-percent load. To minimize the possibility of delay, cutting tools are put up in kits, each kit representing a setup. Three of each tool required are in a kit. In this way the operator may have a tool in the machine while one is returned to the crib for sharpening. The third tool is a spare. In the case of a multiple drilling operation involving 24 drills, there would be 72 drills in the kit.

Incentive System: Management recognizes that machine operators have a stake in the success of the company and that it is necessary to interest them in accomplishing the results desired by the company. When the present standard-hour incentive program was developed, the shop employees were informed of every detail of the plan—good and bad—from its inception. Also, they participated in the selection of individuals from their group for operating the system. As a result, since the inception of the system three years ago, unusual success has been met in the operation of the program.

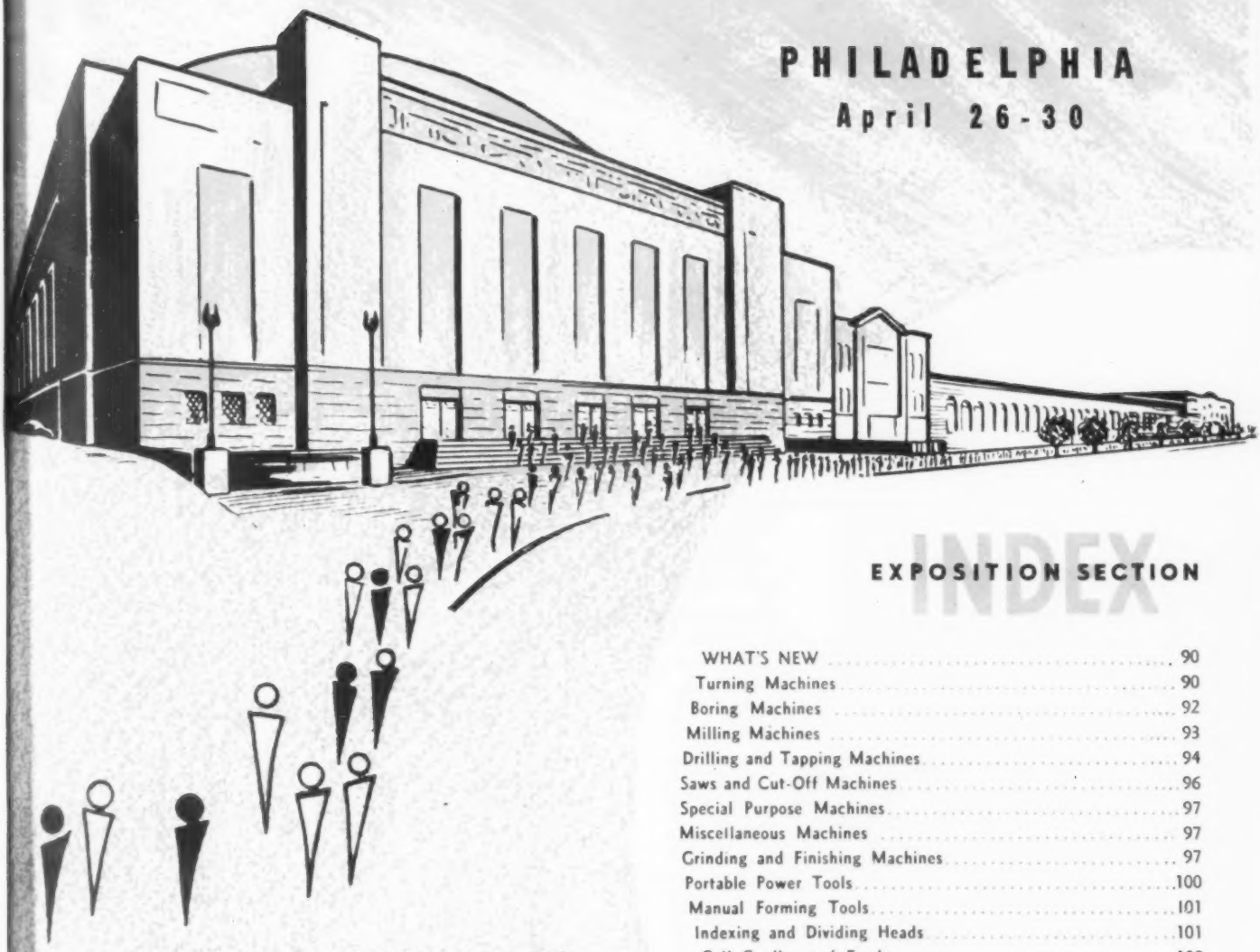
The company has also been successful in bringing unskilled people into the plant and in making them top-notch machinists. More than 500 employees now have acquired new skills and have been promoted. This is in addition to those in apprentice courses who have likewise been promoted. This was done in a period when there was no skilled labor in the area and is a tribute to the effective supervision in the plant.

Management realizes that manpower—men who plan operations and men on the production floor—is by far the most important element in a production plant. Without organization, assistance and active support of its personnel, it would be impossible to achieve the production goals, let alone plan for them. In modernizing a modern plant, equipment must be intelligently selected and effectively utilized.

INDUSTRIAL EXPOSITION

PHILADELPHIA

April 26-30



In the following pages, the editors of THE TOOL ENGINEER will point out typical new products to be shown, and the location and products of each exhibitor at the Tenth Biennial Industrial Exposition sponsored by the American Society of Tool Engineers. If you are planning to attend the Exposition, these pages will help you plan your visit; if you can't make it, they will be your exposition-at-home.

Those attending the Exposition will know what problems they have; the editors can't hope to guess what the home viewer's problems are. To help in that direction, there is a postcard insert on page 201 with which additional information can be obtained on any of the products described. Simply indicate the name of the company, designate the product and the page on which it appears, and additional information will be supplied by the manufacturer.

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ASTE SHOW 1954

WHAT'S NEW at the Exposition

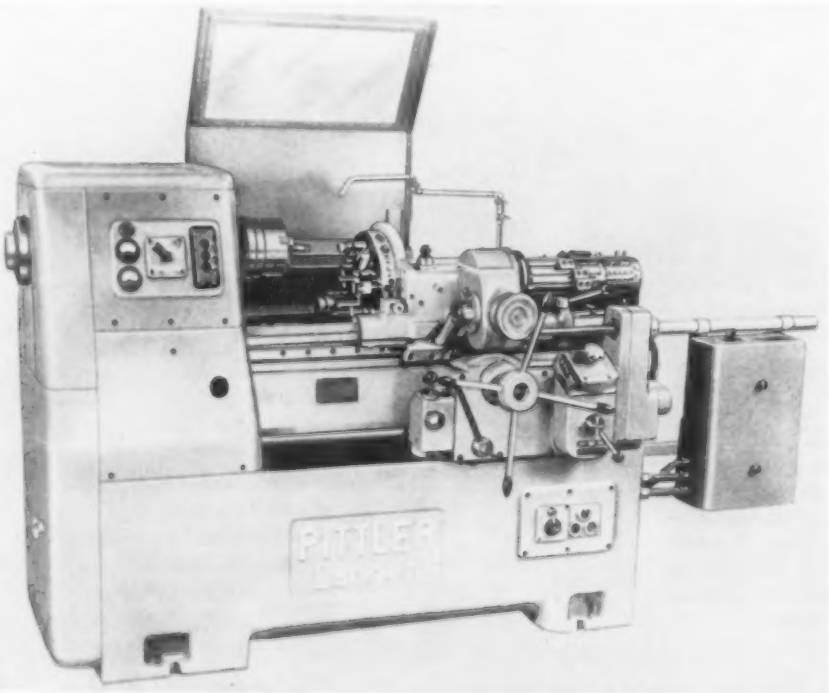
The forthcoming exposition will be by far the biggest in the series of ASTE shows, and it is limited only by the size of the exhibition space available. Not only is it big by physical dimension, but it is big in scope. Behind every exhibit lurks a theme: "Tooling for Competition." In the mind of each show visitor will be the predominant queston, "What can I find here that will put my company in a better competitive position productionwise?" The exhibits can and will answer that question. The answers will have an international flavor because the exhibits will feature foreign as well as domestic ideas, methods and equipment.

Turning Machines

Representing a major departure from single-spindle screw machine design, the new Porter-McLeod Machine Tool Co. Double-Matic is a machine that will do every type of operation—drilling, tappng, forming, threading or chamfering on the back end of a piece as well as the front. Second operations are not necessary. Design of this machine includes a live spindle mounted on the turrent spindle, which contains a collet.

Except when used for tapping or threading, the live spindle runs at the same speed as the main spindle. On the Double-Matic, after the front part of the piece has been machined, it is grasped in the live spindle collet. The exposed back end of the piece is then machined by tools set in the headstock at the same time that the turret tools are machining the front end of the next piece. When the part is completed, it is either pushed through or ejected from the collet. The present model of this machine can accept work up to 1 inch in diameter and up to 4.5 inches long if it has shoulders; up to 8 inches long if it doesn't.

The Pittler drum-type turret lathe, Model Pirofa-45 shown by Cosa Corp., has been designed for high-speed production to an accuracy within 0.0004 inch. The drum holds 16 tools and for mass production, the lathe can be equipped with an automatic cycle speed selector for matching the correct number of revolutions to the turret position. Simplified tooling, no cross slide and the speed selector reduce setup time.



Pittler lathe has no cross slide.

Traub lathe works close to support.

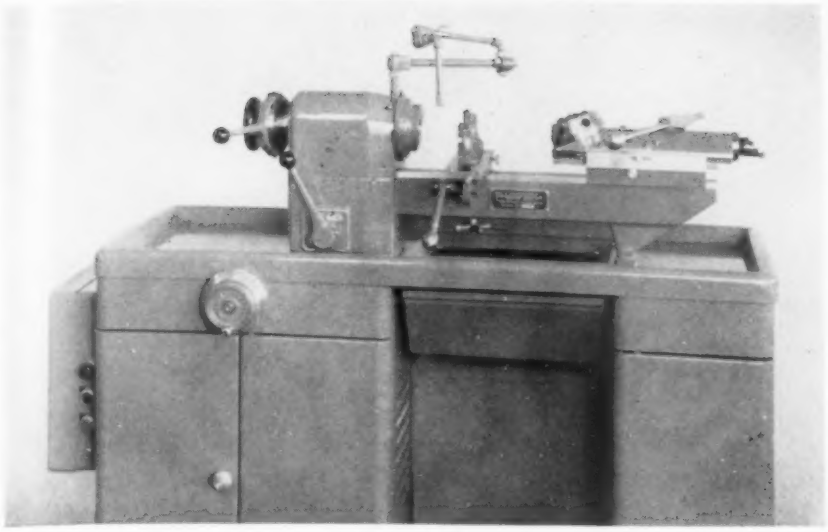
Facing operations are accomplished by revolving the turret at any of three feeds: 0.001, 0.004 or 0.016 inch per revolution. This Pittler has a bar capacity of 1.75 inches and a maximum swing of 20 inches. Maximum chucking diameter is 7 inches and the 16 speeds range from 56 to 1800 rpm.

Exhibited by Guthery Machine Tool Corp., the Leinen Model SR-26-RG has an eight-position turret in the rear that moves crosswise, lengthwise and at angles. It drills, forms, turns, taper turns, profile turns, recesses and cuts inside grooves. A four-position turret in front drills, centers, reams, threads and taps. The machine features automatic longitudinal power feed and has a reversible, stepless infinitely variable drive. The built-in coolant system has a chip separator.

With an automatic bar feed, the lathe has a maximum collet capacity of $1\frac{1}{32}$ inches, maximum turning length of $4\frac{5}{64}$ inches and a maximum chucking diameter of $2\frac{5}{32}$ inches.

Traub turning and copying automatics shown by Guthery Machine Tool Corp. have Swiss-type guide bushing support but differ from the usual Swiss-type automatics. The Traub headstock is stationary and cannot slide axially but the guide bushing can move axially. The front and rear slides are controlled by independent flat cams that can move both radially and axially during the operating cycle. Vertical slides are controlled in the same way.

The Traub has a copying template



Wade hand screw machine for secondary operations.

holder by which the rear slide can be controlled. Rapid feeding equipment accelerates the return motion of the slides, tailstock and tailstock-mounted endworking attachments. Two models of this machine can accommodate a maximum turning length of 4 inches and have collet capacities of $1^{9}/_{32}$ and $1^{3}/_{16}$ inch. Cutting tools can operate within $1/_{32}$ inch of the guide bushing face.

Designed to operate completely automatically, the Pilot copying lathe, H.E.B. Machine Tools Inc., will go through from one to eight cycles as determined by the flat, controlling template. Low setup time results because the carriage feed is hydraulic and the controls for even complicated cycles are simple.

The carriage motion is regulated by a servo lead-screw and is independent of temperature and viscosity of the oil, and the resistance met by the cutting tool. The hydraulic copying device is sensitive because piston movements are determined by a valve that is always open to some extent. Since the copying cylinder is built into the carriage there is no compound slide which contributes to rigidity. The basic Pilot can be fitted with one or more vertical toolslides, which can operate as part of the automatic cycle, and a second cross slide.

A high-speed automatic screw machine, the Index On exhibited by Wickman Products Corp., has been developed for manufacture of components with short cycle times that do not require several turret tools. High production is achieved by high spindle speeds and an overtaking threading attachment. Swinging side tools, grouped around the work spindle, operate simultaneously with the threading spindle and result in cycle times down to 0.8 sec.

Index On side tools are used for longitudinal turning, forming, cutting-off, center and drilling. The side tools normally consist of a bar stop, a form tool and a parting tool. The bar stop arm can carry a drill, or it may be used for transferring the severed component to an attachment for a subsequent operation.

The work spindle runs in only one direction because threading is accomplished by overtaking. The threading spindle has a maximum speed of 10,000 rpm and can overtake at ratios of 1:2, 1:3 and 1:5. Bar feeding and chucking is effected simultaneously in $1/_{3}$ second. For cycle times below 2 seconds, bar feeding and chucking can be reduced to $1/_{5}$ of the cycle time. A selection of attachments, designed at the same time as the basic machine, allows for high-speed drilling, slotting, nut tapping and cross drilling.

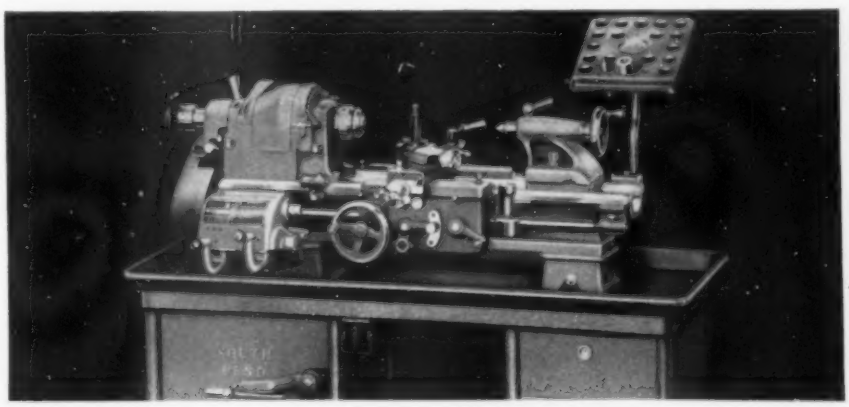
The Models 73 hand screw machine and standard lathe being shown by The Wade Tool Co. are similar in most details. Designed for secondary and repetitive operations, the screw machine is equipped with a double tool cross slide having cut-away case-hardened steel tool blocks and an automatic indexing six-position tilted head turret. The lathe is designed for instrument and tool work and is equipped with a compound slide rest and tailstock. Advantage of the slide rest attachment is the ease with which it can be put on or taken off the bed.

Hardened and self-centering beds used on both machines have two symmetrically bevelled sides, assuring alignment of all attachments. Headstock collet capacities are 1 inch each and both lathes have a 7-inch swing. Spindle speeds are infinitely variable up to 3500 rpm and all bearings are preloaded. Both machines are powered by 1-hp single-speed motors.

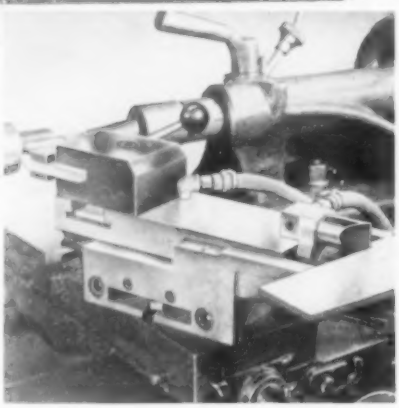
Usually obtainable only on larger lathes at extra cost, an infinitely variable speed drive is optional on the Logan Engineering Co. 12-inch swing lathe. Adjustment is possible while the lathe is turning so that the operator can maintain the correct cutting speed as the tool advances into the work. In back gear the speed range is 38 to 295 rpm; in direct drive, it is 250 to 1575 rpm.

The high-speed Koping lathe exhibited by Mattsson Machinery, Inc. has a total of 18 spindle speeds in geometrical progression and it is possible to change to any adjacent speed while the lathe is running. All gears for the main spindle drive are case hardened and the shafts for the spindle drive run in adjustable tapered roller bearings. The spindle itself runs in adjustable cylindrical roller bearings.

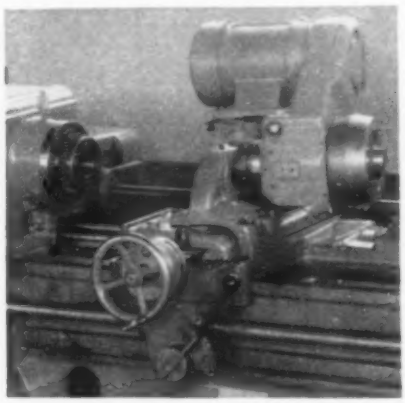
South Bend Lathe Works is announcing improvements in their 10-inch lathe series that are designed to result in greater versatility and ease of operation. Use of a two-speed motor increases spindle speeds from 12 to 24, and a wide screw cutting range is now standard on the 1-inch collet lathes, both bench and floor models. A total of 70 threading changes offers not only the middle range of constantly used



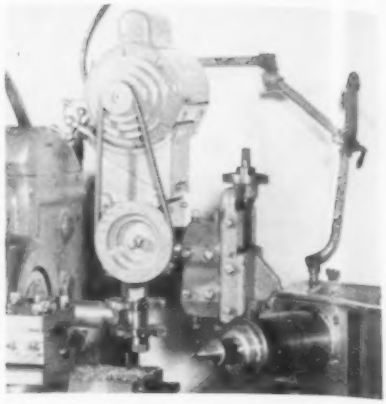
South Bend ten-inch bench lathe.



Lehigh profile tracing tool.



Rapidus thread-milling with carbides.



Master milling head on a lathe turret.

shop threads, but gives extras usually available only on custom machines. Thread pitches cover all American Standard screw threads, as well as pipe threads, fire-hose coupling threads and some for instrument and hydraulic work. Micrometer collars are incorporated on the cross-feed and compound rest screw controls and swiveling machine handles make for easy movement of apron and dead center.

Attachments: A pneumatic profile tracing tool, Model M 1500 by the Air Control Div., Lehigh Foundries, Inc., can be mounted directly on the cross slide of 16 to 24-inch lathes. Slap and side play of the attachment are reduced by having the horizontal slide operate between two rows of preloaded ball bearings. A rotary stylus with positive wedge lock permits the cross-feed screw to be set in one position and not moved during repetitive production. A standard toolpost, a square turret or a quick change toolholder can be used. Stroke of the tool is four inches.

New tooling has been designed for the Versa-Mil Co. keyseater, slotter and shaper that increases its range of work. This unit can be mounted on the cross feed slide of a lathe, used with other machines or used by itself as a portable shaper. The new tooling enables cutting with the tool bit above or below the tool bar, or pointing to either side. It can cut slots or plane surfaces in all four positions at any required angle. The new toolheads offer tool relief by a clapper-like action but do not depend on gravity to return the bit to proper cutting position. The basic unit can mill, drill and bore in a range of 13 speeds from 44 to 450 rpm.

Thread milling with cemented carbide cutting tools is possible with the Rapidus attachment exhibited by Ted Grob Co. The cutter spindle is powered by a 2½-hp motor through V-belts. Four cutting speeds are available. Carbide-tipped, axially adjustable tool bits are held in the cutter head by wedges. To achieve vibrationless operation required for use of carbide tooling, the spindle is short, heavy and mounted in two journal bearings. Axial thrust is absorbed by two preloaded ball bearings. This attachment will be shown with special long-thread milling machines on which it can be used.

The Master Manufacturing Co. is introducing three different types of attachments for turning tools. One, Model H, is a heavy-duty milling unit for use on large lathes and other machine tools. It is particularly useful for milling large keyways in heavy shafting and slab milling long workpieces where the most practical place to perform the operation is while the piece is between centers. It can be used on lathes with a 24-inch swing and larger.

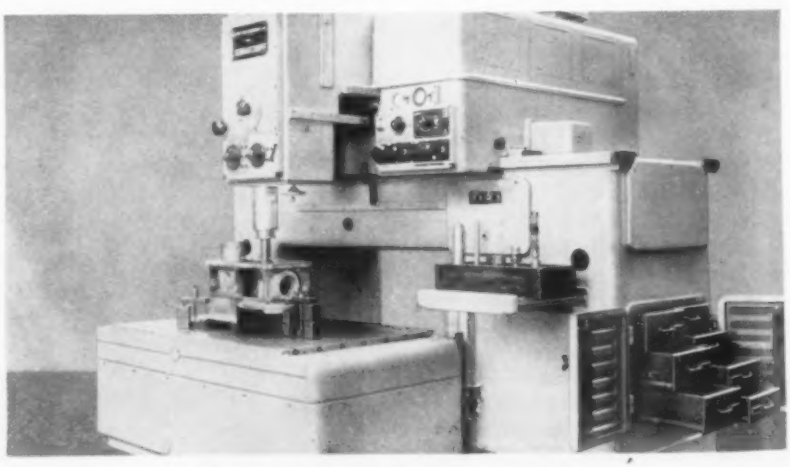
A large variety of milling operations can be performed on a turret lathe with the Master milling head. Mounted on an adjustable turret tool-slide so it can be positioned on the work and for the depth of cut, the head has a vertical spindle.

The Master self-powered drilling head can be mounted on any of the tool stations in a turret lathe. Straight holes can be produced with this attachment because both the work and the drill rotate. In many instances, drilled holes do not have to be sized with boring tools. When mounted on an adjustable toolslide, off-center drilling and boring can also be accomplished. Interchangeable arbors are available with this attachment for adapting a wide variety of tools, such as boring tools, reamers and cutters.

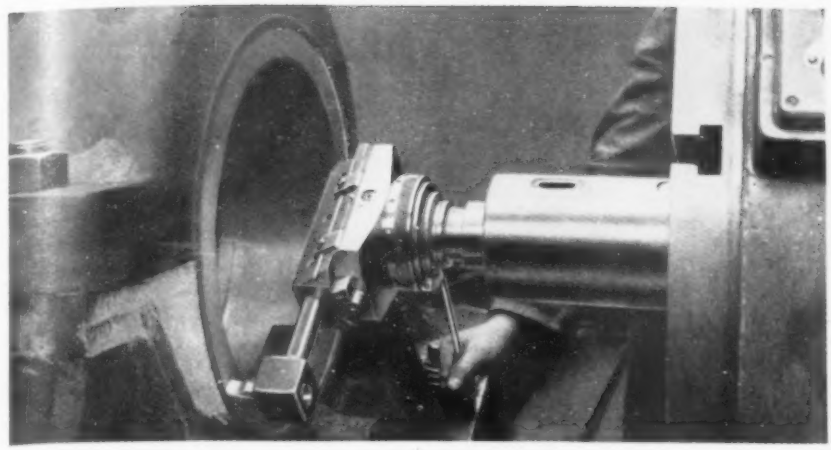
Boring Machines

A vertical boring machine, the KBF_2 shown by Marac Machinery Corp., features automatic location over an area of 30 x 50 inches. Any number of locations can be set without the use of dials, leadscrews or end rods. While one bore is being machined, the next location is preset. Each of the slides that support the boring head is fitted with a motor-driven drum containing a set of end gages, with 0.0002 inch as the smallest step.

Automatic hydraulic clamps rigidly hold the slides in position as soon as the head is correctly positioned. Both motions are independent so that any number of bores can be made on a common centerline without introducing errors. Additional operating savings result if, when boring production quantities, a punched-card program attachment is used. With this attachment, all bores are made without attention by the operator.



The KBF_2 automatically locates holes.



Wohlhaupter boring head serves many functions.

Having the handling ease of a horizontal boring mill and the precision of a jig borer, the Dixi 60 exhibited by M.B.I. Export & Import, Ltd., is suitable for production of jigs, fixtures and precision parts. This machine has a rotary table, can machine deep holes with end support for the bar and can feed the workpiece toward the bar to reduce tool overhang. Built-in microscopes are used to adjust vertical travel of the headstock and end support, and rotation of the table. Precision of location is 6 seconds of arc for the table and about 0.0001 inch for linear motions.

The Dixi has two infinitely variable speed ranges covering spindle speeds between 30 and 1200 rpm. Mechanical spindle feeding can be automatically stopped at a preset position. Spindle travel is $24\frac{3}{8}$ inches, vertical travel is $19\frac{5}{8}$ inches and feed is in six steps between 0.0015 and 0.01 inch per revolution. Instead of boring through housing holes, the table can be rotated through 180 deg. which keeps tool overhang minimum.

Attachment: Karl A. Neise is exhibiting two new models of the Wohlhaupter universal facing and boring heads. These heads can be used in boring mills, jig borers, radial drills, lathes and milling machines, and can be used for boring, facing, turning, recessing, undercutting, inside thread cutting, or, within limits, taper-boring. These heads increase the number of operations that can be done with one setup on one machine. These heads have integral shanks and all sliding surfaces are lapped to increase accuracy. The new models feature intermittent, automatic cross traverse feed and when the slide reaches a preset stop, the feed is stopped. Disengagement also takes place automatically whenever excessive cutting pressure is encountered.

Milling Machines

Graham Machine Tool Co. is exhibiting the Pearson Model H turret-type milling machine. With a high-speed motorized vertical head and powered down feed, this mill is designed for rigidity and accuracy. The column and base are made from a single iron casting with the coolant tank built into the base.

The head can be used at any angle and the turret rotates 360 deg. Automatic feed and rapid traverse of the table are available as extras. The spindle is alloy steel mounted in ball bearings, having draw bar for collets and being hollow for double-end mills. The quill is hardened, ground and lapped. Quill feed is from 0.0015 to 0.006 inch. In 8 steps, spindle speeds range from 264 to 4100 rpm.

The Koping VF-2-A vertical milling machine exhibited by Mattsson Machinery, Inc. is constructed to Swedish standards and calibrated in millimeters. From the motor, V-belts run to two driving pulleys; one for the milling spindle and the feeds, the other for the quick power traverse of the table. The table is equipped with two nuts for the longitudinal feed to prevent backlash when climb-milling. Hand feed, power feed and quick power traverse of the table is possible in longitudinal, transverse and vertical directions. The feeds and quick traverse can be operated by dogs on the table.

The spindle of the VF-2-A is heat treated alloy steel and runs in one double row cylindrical roller bearing and two thrust ball bearings. The largest gear on the spindle is formed as a flywheel to secure smooth vibrationless running. The spindle has hand feed, power feed and quick power traverse in both directions. The power feed of the spindle can be used only when the spindle head is in the vertical position.

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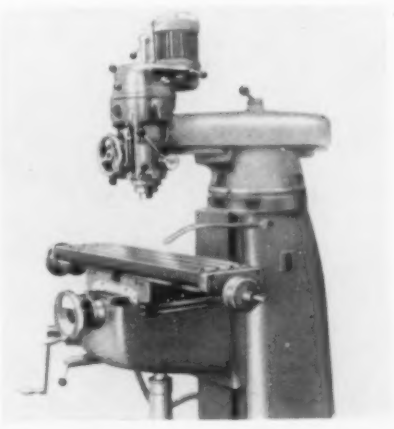
Another Swedish milling machine, the Sajo Model UF 54, is to be shown by Austin Industrial Corp., but it is built for U.S. service, with electrical equipment meeting U.S. standards, and with inch system screws and dials. This all-geared universal machine has individual motors and drives for spindle and table. All shafts in the spindle drive are mounted in tapered adjustable roller bearings. The spindle is mounted in roller bearings with two thrust ball bearings.

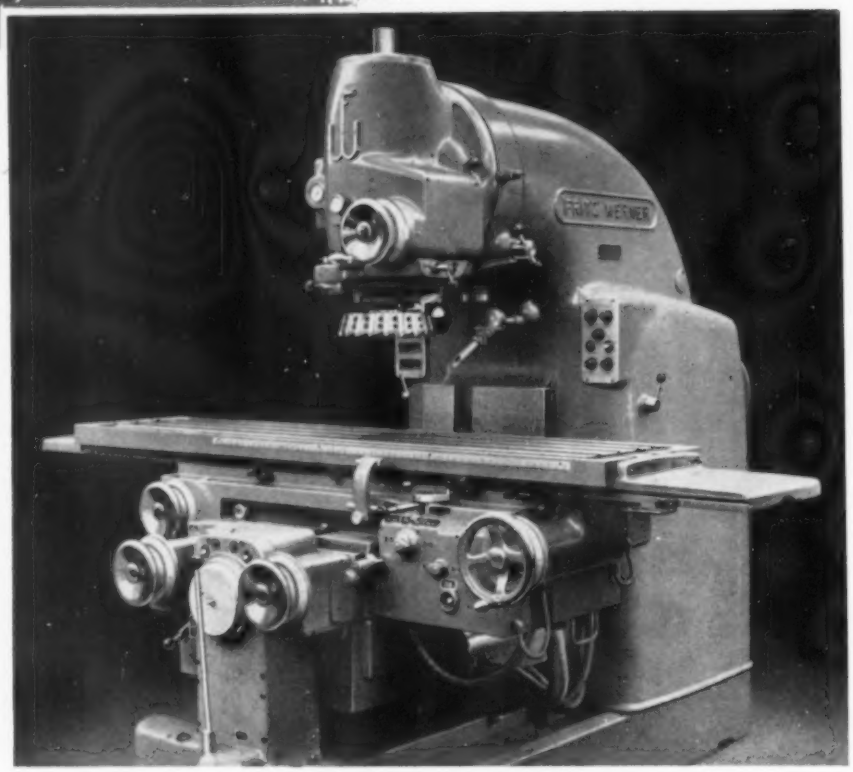
Table feeds of the Sajo can be by hand or power in all directions. There are 16 spindle speeds between 39 and 1500 rpm and there are 12 feeds. They range, in inches per minute, from $\frac{11}{16}$ to 25 for longitudinal and cross, to $\frac{11}{32}$ to $12\frac{1}{2}$ for vertical. The machine includes provision for climb milling.

Possessing versatility for production of single items or large runs, the Werner No. 5.235 vertical milling machine shown by Marac Machinery Corp. also has a wide range of feeds and speeds. There are 42 spindle speeds between 16 and 1800 rpm and 50 feeds between $\frac{3}{16}$ and 80 inches per minute; both with progressive ratios of 1.12. Speed and feed for the next cut can be preset while the machine is cutting. These electro-hydraulic controls can be released only when the spindle is stationary. The longitudinal slide, cross slide and knee are automatically hydraulically clamped when the direction of feed is set.

The milling head can be swivelled 45 deg to either side of the vertical. This machine has been designed for pendulum milling and permits continuous and uninterrupted operation with automatically controlled rapid traverses, since loading and unloading can



Pearson turret type milling machine.



The Werner miller features a dipping knee.

fall within the milling time. When using such a cycle, workpieces are changed at one end of the table while those at the other end are being milled. After the table returns, the feed can be started in the opposite direction, since table feed can be used in both directions with the spindle rotation remaining the same. On the return stroke, the knee automatically dips two inches so that the tool will clear the finished work and any new pieces placed on the table. The table automatically rises to the proper level at the end of the return stroke.

Accessories: The Master Manufacturing Co. will be introducing a self-powered, geared mill converter head. This double compounded vertical milling head is rugged enough for heavy duty vertical milling on a regular horizontal mill. It will be available in three sizes from ¾ to 5hp. The head can be mounted on various milling machines through an adapter plate that fits the vertical dovetails on the column face of the mill. The head can be set at angles up to 45 deg, and by mounting the motor on the outer face of the head, even greater angles are possible. The two compound angular adjustments are to position the spindle in a plane parallel to the column face and to position it at right angles to the column face.

Grand Tool & Supply Co. will exhibit milling machine arbors and shell end mill arbors with No. 30, 40 and 50 national tapered spindles. These arbors are imported from Germany and are made of alloy steel. After finishing, the arbors are hardened and ground to close tolerances.

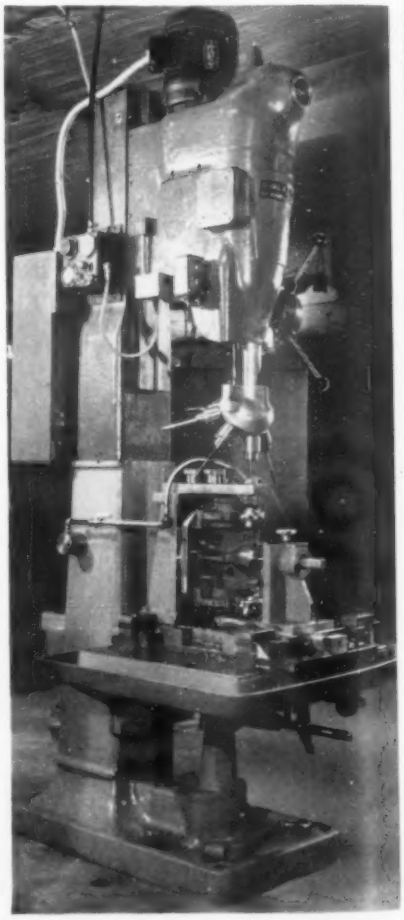
Drilling and Tapping Machines

A new approach to drill press operation has resulted in development of the Howe & Fant turret drilling machine. One operator can perform up to six different drill press operations at a single location. A six-spindle turret is mounted on the single quill, and spindle speed, depth control and automatic reversal can be individually preset for each spindle. Only the spindle in use rotates and all other tools point away from the operator.

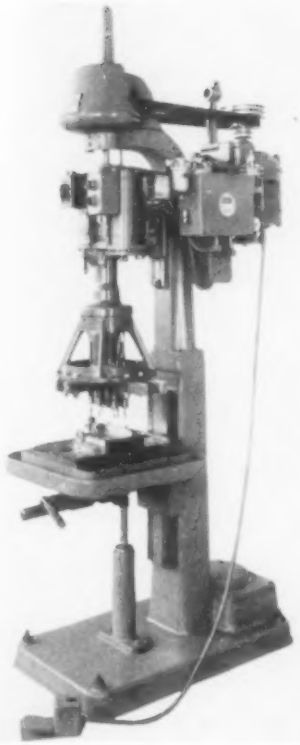
To set up the machine, the operator indexes the first spindle and selects any speed from 200 to 4000 rpm. He lowers the quill to the level required for maximum depth and sets a depth stop that holds depth to within 0.002 inch. If this spindle is to be used for tapping, he raises a small trip dog that actuates an automatic motor reversing mechanism. He then indexes, sets speed and depth, and reverse if needed, for each of the other five spindles. When tapping, the spindle will automatically reverse at twice forward speed when the maximum depth is reached or when the hand-wheel movement is reversed. The turret can be indexed in either direction to any desired station. This turret drill has a rated capacity of ½ inch in steel. It uses a two-speed motor and has a 6-inch quill travel.

The Taylor Dynamometer & Machine Co. will show several models of their Series A sensitive drilling machines. The spindles of these machines are counterpoised to permit delicate feeding and so the operator can feel the bite of the drill. Special chucks are available to hold drills as small as 0.006 inch in diameter. Speed range is between 800 and 10,000 rpm in steps of about 100 rpm; some models have speeds up to 40,000 rpm. The feed mechanism is composed of a rack and pinion operated by a small handwheel.

Simplified controls placed where the operator can reach them are the outstanding feature of the new Raboma radial drill to be shown by Marac Machinery Corp. Small dials can be set to any desired speed and feed while the machine is operating. Upon re-engagement of the clutch, the machine is automatically set for the new conditions. Thirteen spindle speeds range from 45 to 2800 rpm and there are 12 feeds from 0.0008 to 0.040 inch. Automatic clamping of the boring head to the arm, and the arm to the column is done with one set of pushbuttons in the center of the handwheel. Clamps are hydraulically operated. Spindle disengagement for tool changing is ob-



Howe & Fant turret drill.



The Beckett-Harcum multispindle unit.

tained by pressing a button and the drive re-engages automatically. Blind hole tapping can be done without a tapping head because the controls are so sensitive that the tap can be reversed instantly.

A universal radial drilling machine will be demonstrated by H.E.B. Machine Tools, Inc. The Constan Type 23 is motorized to reduce manual operations, increase flexibility and reduce nonproductive time. Switches are located in a handle on the head so that normal arm motions activate the motor to advance or retract the head in relation to the column. A second set of switches activates the head up or down, and both sets of switches can be used at the same time. The head is swung radially by hand and is held in position by an electric break. The spindle feed can be manual, automatic or a combination, and the spindle rotation is automatically reversed for tapping.

The Asquith O.D. 3 radial drilling machine, exhibited by Associated Machine Tool Corp., features concentrated control, rigidity and accuracy. All levers and handwheels are grouped on the spindle slide, and stop, start and reverse of the spindle is controlled by a single lever that also controls the arm elevating motion. The machine has 18 spindle speeds and 9 feeds. The spindle feed is of a self-applying type. The spindle is wound down until the drill touches the work. A slight downward pressure then applies the power feed.

Designed primarily for production multiple-spindle drilling and tapping, the Model C-16-T Beckett-Harcum Co. machine has a sensitive tapping action through use of an electrically controlled low pressure air thrust synchronized with a fast reversing motor. Threads can be tapped without a clutch or lead screw and there is no tearing or distortion of the thread because after the tap enters the work the only forces acting on it are rotary. This drilling machine can also be used on light metals and plastics.

Kaufman Manufacturing Co. will exhibit a No. 75 hydraulic combination drilling or tapping unit with one head. The head can be used with a single spindle or can be adapted to drill or tap two or more holes at a time. Installation of the leadscrew assembly and a few minor adjustments change it from an automatic drilling unit to an automatic tapping machine. Long life is assured for the leadscrew that runs in an alloy bronze nut with constant pressure lubrication and cooling at high speeds. Hydraulically operated clutches give an unlimited number of reversals per minute without heating or overloading the motor.

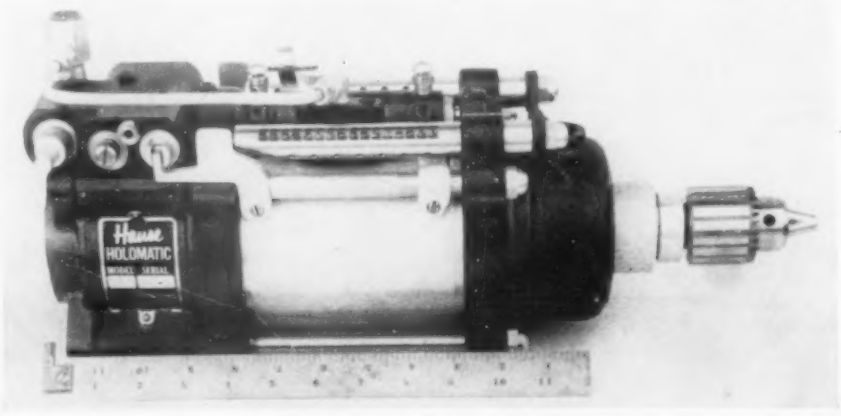
Hause Engineering is exhibiting several additions to the Holomatic line of which the Model 14 is representative. This unit is powered by compressed air, hydraulically fed and suitable for automatic or manual cycle control. The stroke is adjustable to a maximum of 4 inches with sufficient thrust for drilling ½-inch diameter holes in steel. Positive stop with dwell or instantaneous retract operation; continuous cycling, skip drilling, back feeding and manual jogging are easily achieved with this unit. Rotary air motors are available with capacities to ¾ hp and speeds up to 15,000 rpm. These units can be used for drilling, tapping, threading and, with Subland drill-taps, can drill and tap at one pass.

Drillunit, Inc. is announcing two new Drillunits that deliver a 12-inch stroke from a 16⅜-inch base, and a 9-inch stroke from a 13⅜-inch base. This self-contained hydraulic unit is designed to be mounted on a machine in any position for extra drilling and boring operations. It is adaptable for use on transfer machines. It has a traverse rate of over 400 inches per minute and a feed rate up to 30 inches per minute. Capacity of the 175-lb unit is ½ inch in steel.

The Thread-All Sales Co. has added several items to their line of tapping machines. A horizontal tapping machine is now available with the same speed and accuracy as obtained with the Thread-All vertical tapping machine. A portable tapper, weighing less than 15 lb can be used in any position. The taps in this unit float in all directions, compensating for any operator movement. A heavy-duty vertical tapper is also available.

Attachments: Superior Hone Corp. will exhibit the Model VH honing head that is adaptable to most drill presses. A size dial on the bottom of the head permits changing the size while the hone is in operation. A lever on the side releases the stone from the work and expands the stone to the same size under spring pressure for the next part. The only adjustment necessary to duplicate size is for stone wear.

A new adjustable torque driver, the Safe-Torque, will be exhibited by Scully-Jones and Co. A new application of the roller-drive principle, the driver releases completely without friction, heat or wear. Drive consists of a shell, two rollers and an inner-cam drive collet. Torque is transmitted when the rollers are wedged between the shell and the cams on the drive collet. When driving torque exceeds



Hause Holomatic is air powered and hydraulically fed.

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Magna drill with leadscrew tapper.

the preset limit, the shell expands, permitting the rollers to enter a cylindrical portion and releasing the drive.

Five settings permit adjustment of the torque release point. Operators can bottom tap at high speeds without fear of breaking taps when using the new driver. A spring-loaded centering plug behind the drive collet permits the machine spindle to advance slightly after the roller drive releases, absorbing the shock when a tap bottoms. Three standard sizes are available for tapping on any machine having a reversing spindle.

Probably most important of the Magna Engineering Corp. exhibit of new attachments for the Magna drill is the leadscrew tapper unit. This attachment completely replaces the drilling quill and leads to rapid tool change. Available in standard leads from 10 to 32 pitch, the attachment includes all necessary electrical equipment. Shown for the first time is a rapid approach unit that reduces the cycle time of the Magna drill. At the push of a button, an air plunger drives the quill to any preselected position at which point the regular power gear feed takes over.

The Ettco Tool Co. will introduce a completely new design of leadscrew tapping and threading device, the Ettco-Emrick No. 2 unit. It is self-contained and powered by a standard ¾-hp motor, a reversing motor not being necessary. Completely electrical, the unit can be used in conjunction with other powered tools and operates in any position. Tapping and threading operations can be accomplished with spindle speeds to 2000 rpm and 1500 cycles per hour. It features variable speed and torque control.

A new line of leadscrew tapping attachments for use with any standard drill press will be introduced by Automatic Methods Inc. The new tappers incorporate a leadscrew, reversing mechanism, depth control and an automatic or manual activating lever. They feature a new cone clutch and are driven positively by a floating lock assembly. The new units can tap blind holes and holes in a recess without loss of lead. Automatic Methods will also exhibit a new 500 Series support arm for leadscrew tapping attachments. These units can be used with 16 to 20-inch diameter columns and feature an adjustable support arm.

A rigid set of design specifications has resulted in the Rotafeed which will be exhibited by The Pneuma-Draulic Co. It is a hydraulically controlled pneumatic power feed unit that can be applied to most drill presses. The unit has a large thrust with reserve capacity for mutiple-spindle drilling and uses 40 to 60 psi air. Its direct in-line mounting avoids mechanical losses inherent in side-mounted feed units, and permits retention of the drill-press handle for manual operation. The cycle includes rapid approach, hydraulically controlled feed through the work and instantaneous return. A large saving is introduced by differential pressure regulation that avoids waste of high pressure air on the return stroke.

Saws and Cut-Off Machines

A high-speed hacksaw built to U. S. standards, the Sajo Model RC-250 has a capacity of 10 x 10 inches. Exhibited by Austin Industrial Corp., this machine has a saw frame that is reciprocated by a large flywheel. The length of stroke is readily adjustable between 4 and 7¼ inches. An automatic lift feature on the return stroke clears the blade and prevents damage. The vise is designed to permit both straight and angular cuts up to 45 deg. This machine has centralized controls and an eccentric feed-in roller. The hydraulically applied cutting pressure can be varied from zero to maximum during cutting.

The Circular Tool Co. will exhibit a new line of circular metal cutting saws made of Circoloy. This is the designation for a product that fills the gap between carbide and high-speed steel cutting performances. Previously, applications requiring faster cutting and longer life than possible with high-speed steel had to be met with carbides.

Another gap has been filled through the introduction of the first practical high-speed steel band saw by DoAll Co. The Demon band will do jobs not previously possible with high-carbon alloy steel saw bands. The new bands are available in both Precision and Buttress tooth styles. Along with the new bands, DoAll will show a line of semiautomatic band machines that feature hydraulically actuated machine movements and adjustments.

The Model 28 Sever-All cut-off machine, to be exhibited by the Campbell Machine Div. of American Chain & Cable. In this machine, the work is clamped on both sides of the cut. Safety is provided for the operator by totally enclosing the cutting wheel during the cutting operation, except for openings in the guards to clear the work. The guards are hinged and can be lowered. Being able to lower the guard permits accurate positioning of the work and obviates the need for threading long pieces through the guards. The machine is furnished with either a 7½ or a 10-hp motor and has the following capacities: solids, up to 3 inches; angles and channels, 8 inches; tubing and pipe, 4 inches OD and 45-deg angles and channels, 4½ inches.

Campbell is also exhibiting the 476 wet abrasive cutting machine. Fully automatic and with an oscillating head, this machine feeds the stock, clamps it, adjusts for wheel wear, ejects cut pieces and stops after the final cut. Adjustment of the timing cycle is unnecessary, regardless of the stock being cut or the length of feed, because it is sequence timed. Capacity of the machine is 6-inch solids and the maxi-

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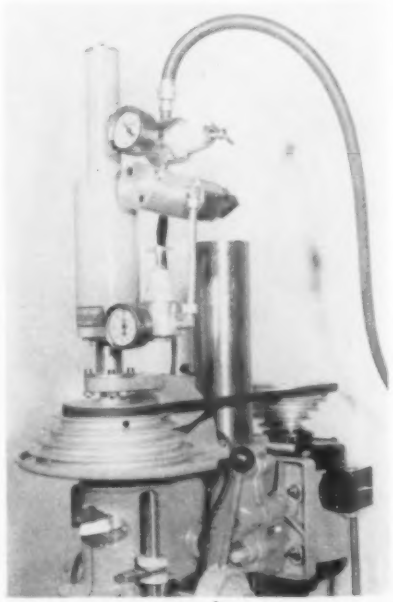
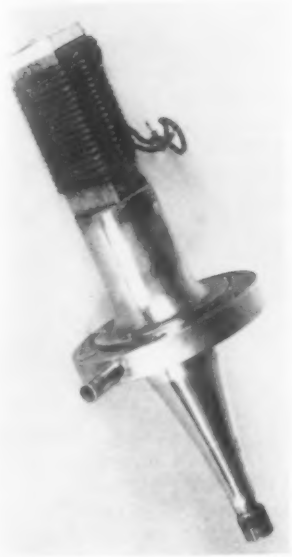


Rotafeed drill-press feed saves air.

WHAT'S NEW



Raytheon ultrasonic cutting tool.

mum single feed length is 18 inches. The abrasive wheel is 20 inches in diameter and $\frac{3}{32}$ to $\frac{1}{8}$ inch in thickness. The swing arm is a box type, heavily ribbed casting.

Special-Purpose Machines

Development of a special magnetostrictive transducer has resulted in the successful manufacture of an ultrasonic machine tool, Model 500, which will be displayed by Raytheon Manufacturing Co. Using standard abrasives in liquid suspension, the device offers a method of cutting intricate shapes in hard and brittle materials. This machine can cut hard materials whether they are conductive or not.

The theory of the machine is not complicated, although the exact mechanism by which the material is removed is not known. The forming tool is made to vibrate at a frequency of 27 kc with a small amplitude. If a commercially available abrasive is introduced between the tool and the work, a hole will be formed that is an exact reverse of the tool.

George H. Alexander Machinery, Ltd. is going to exhibit a universal diesinking machine with a self-adjusting spring loaded spindle. This new machine, No. 3, does not have a weight arm since the pantograph is automatically balanced for any given ratio at an angular position of ± 20 deg. When the ratio of reduction is altered, a simple hand adjustment is all that is needed to restore balance. A second leadscrew is provided so the copy table can be adjusted longitudinally. Principal slides are provided with wipers and the main horizontal and vertical leadscrews are protected by accordian dust covers. This machine has 14 spindle speeds ranging from 475 to 9500 rpm in geometrical progression.

The Traub automatic chip separating machine separates chips and finished parts automatically at rates up to 5000 finished parts per minute. Chips and finished parts are simply thrown into the hopper on top of this machine, exhibited by Guthery Machine Tool Corp., after the cutting oil has been separated from them. Finished parts come out of the front of the machine and the chips are ejected at the side by means of a blower system. The machine can handle parts up to 7 inches long and 2 inches in diameter.

Miscellaneous Machines

Edward A. Lynch Machinery Co. will exhibit the Morton Model A-3 stake welder equipped with an automatic inert arc torch. The stake is rigid, accommodating flat cylindrical material up to 8 gage. The outboard lock supports the stake while clamping and the gaging bar is operated manually. The machine will automatically weld longitudinal and girth seams. Its capacity is 6 to 36 inches diameter and 42 inches in length.

A 6-A-8 Chicago press brake will be shown by Edward A. Lynch also. This brake is light duty model with an all-welded frame. A twin-plate deep section bed provides extreme lateral rigidity. The drive is infinitely variable between 20 and 50 strokes per minute. Power adjustment of the ram is made with a separate motor. Adjustment can be split so that one end can be raised or lowered to tilt the ram for tapered work.

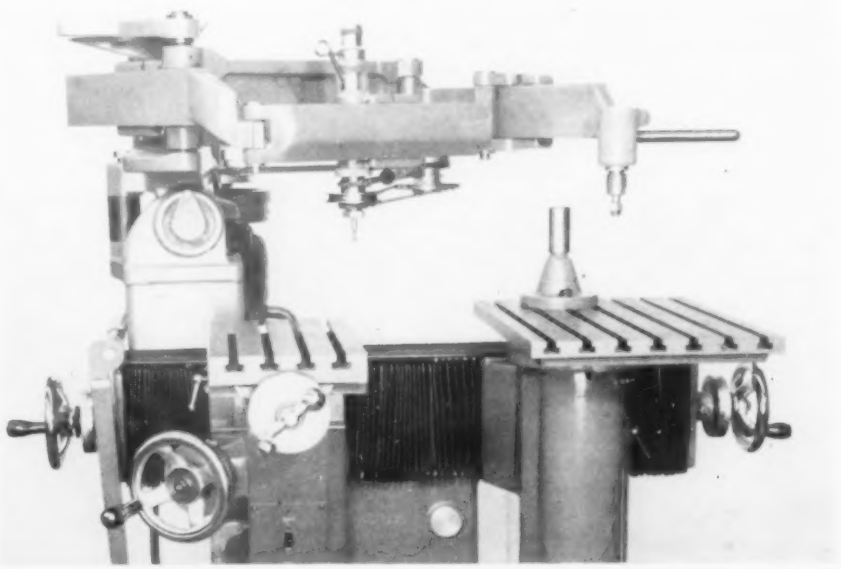
Heavy and rigid in construction, the Model 2524 nibbling machine exhibited by Campbell Machine Div., American Chain & Cable Co., will do all nibbling operations within its capacity without distorting the metal, setting up strains or incipient fractures. A variable-stroke feature makes possible the compensation for metal thickness. Work can be guided to follow a line or to cut irregular shapes through use of a template. The machine has a throat depth of 24 inches and can cut low-carbon steel and other soft materials up to $\frac{1}{4}$ inch thick. Maximum thickness of corrosion resisting steel that can be cut is $\frac{3}{16}$ inch.

Austin Industrial Corp. will show the VMA Model ES-26 universal shaper that has a 7½-hp main drive motor and a 1-hp table traverse motor. Its design features include a double helical tooth crank gear, automatic forced feed lubrication and hardened chrome nickel gears running in an oil bath. This machine is built to U. S. standards and is calibrated in inches. The tool slide can be swivelled 60 deg either way from the vertical. All slide faces are carefully scraped. The rapid traverse motor can be actuated only when the ram is not operating.

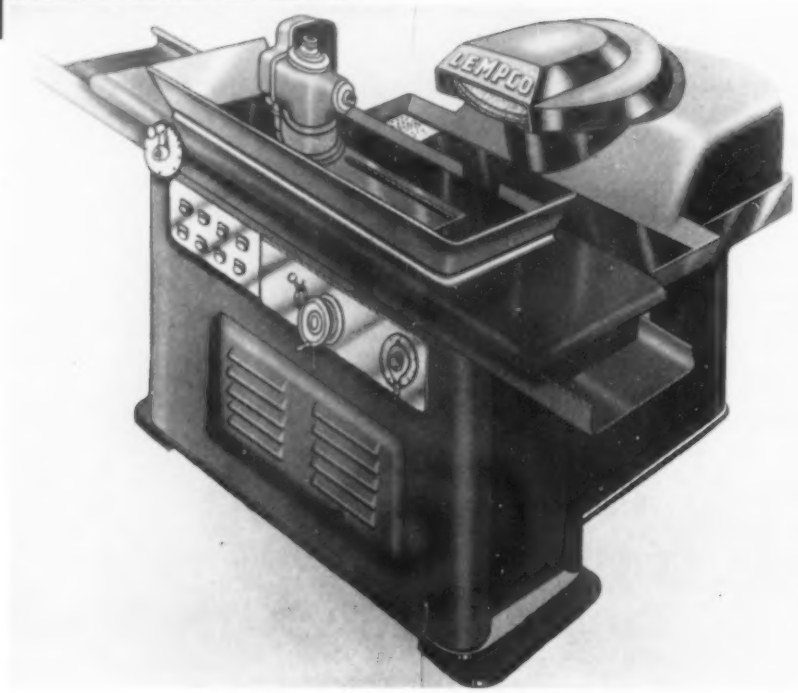
Grinding and Finishing Machines

The Automatic flute grinding machine developed by Lempco Products Co. uses a 20-inch grinding wheel features control largely accomplished by a precision limit switch system engaged and disengaged by manual pushbutton stations. The machine has a 5-hp, 1200-rpm sealed-bearing motor and a table driving system comprising a sealed hydraulic system, cam operated, driven by a ¾-hp, 21-rpm gearmotor.

Grinding wheels as small as 14 inches can be used. Production of the machine



The automatically balanced Alexander diesinking machine.



Lempco automatic flute grinding machine.

is 21 fifteen-inch strokes per minute. Capacity is 2 to 10-inch diameter cutters with a 6-inch maximum length. Only straight flute and angle cutters with from 3 to 32 teeth can be handled by the present grinding machine.

The Thule surface grinder, Type TPH shown by Mattsson Machinery, Inc., has a horizontal spindle. An outstanding feature of these grinders is that they can be equipped to supply the coolant through the wheel instead of at the periphery from the outside as is normally done. This cooling method is used when high surface finish and accuracy are required, and where effective cooling of the workpiece is necessary.

Mattsson Machinery is also showing the UVA Turbo-Head air powered grinding spindle that grinds with small quills at speeds up to 100,000 rpm. An air turbine is used in this machine because it can be loaded until the rotor stops without being damaged. When loaded, such a turbine automatically adjusts itself to a speed that corresponds with the load. For best operation, this drill unit requires 60-psi dry air.

Marac Machinery Corp. is exhibiting a new Jung internal grinder with an internal profile dresser. This machine can be used for all internal cylindrical shapes with inside diameters between $\frac{7}{32}$ and $1\frac{1}{2}$ inches. Table traverse is variable up to 120 strokes per minute and the standard grinding spindle rotates at 35,000 rpm. The machine can be equipped with a 75,000-rpm spindle, or can be simplified to operate only for plunge-grinding. The form dressing attachment permits the plunge grinding of bullet, cartridge and similar dies.

The Type 14-TC wet or dry face or tool grinder to be exhibited by The Standard Electrical Tool Co. was specifically designed to serve the need for a high-production single-point tool grinder. It can handle a large flow of coolant without splash or spray. The table tilts to the correct angle and a quick acting fixture fitted on top of the table securely clamps the tool at the desired angle. The spindle has a splined quill so that moving of the wheel does not affect belt alignment. This machine is also available with hydraulic wheel head and table traverse, and an automatic wheel-wear compensator.

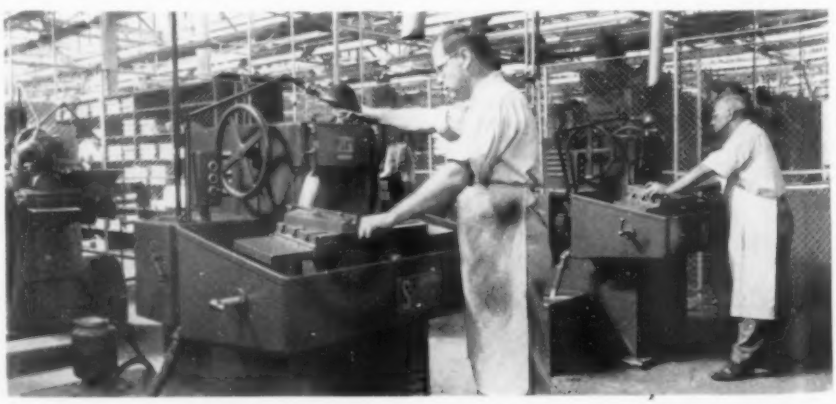
A. A. Jones & Shipman Ltd. will exhibit a line of precision grinding machines having hydraulic table traverse with infinite speed steps, and accurate and shockless reversal of travel. Cross feed movement is intermittent. The Model 1300 universals are fitted with a rising and falling swivelling wheel head for handling all types of tool and cutter grinding operations. The wheel spindle carries an external grinding wheel for cylindrical grinding and a cup or saucer wheel for tool and cutter work.

Incorporating many of the features of their larger machines, the new Hammond Machinery Builders Model D-6 wet carbide tool grinder is designed for safety and high production. Safety caps fill the open cups of the wheels and prevent accidental injury. Tables adjust to compensate for wheel wear. Two operators can grind tools at the same time with freedom of movement and unobstructed vision. The table of the D-6 can be set anywhere between 30 deg above and 30 deg below horizontal. Under each wheel is an exhaust outlet for connection to a dust collection system.

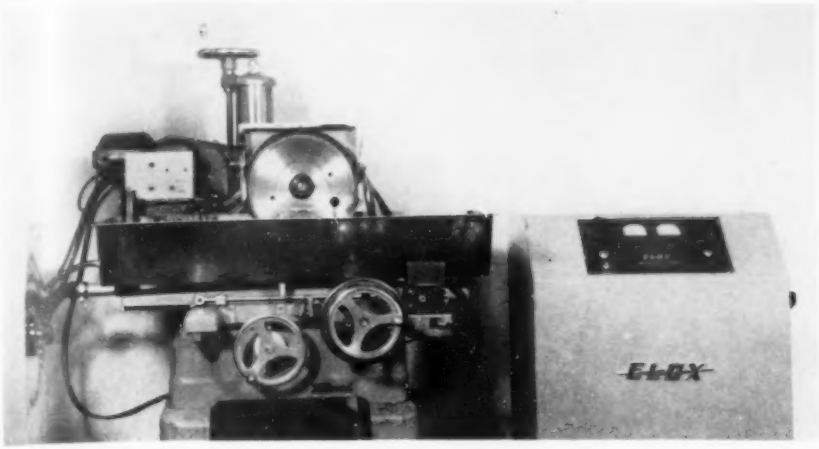
The Vari-Tool finisher of The Standard Electrical Tool Co. is a combination machine equipped with a silicon-carbide grinding wheel on one side and an abrasive belt operating over a wear resistant platen on the other side. High-speed steel and carbide tools are roughed on the wheel and finished on the belt. A design feature of the back stand is a ball eccentric that allows rapid replacement of belts without the need for realigning the tracking of the belt.

With a capacity for sharpening $\frac{1}{4}$ to $2\frac{1}{2}$-inch drills to a standard lip angle of 59 deg, the Sterling Model DB grinder exhibited by McDonough Manufacturing Co. can handle 2, 3 and 4-lip drills with equal ease. No chucks or collets are required. This unit features automatic take-up to compensate for wheel wear and has a permanently mounted diamond dresser that swings out of the way while grinding.

The Elox Corp. of Michigan will demonstrate electrical discharge machining as applied to grinding. Using their standard electronic equipment and a brass wheel, any conductive material can be ground to as close toler-



Two of six 14-TC's grinding 70,000 tools per month.



Elox electrical discharge machining applied as a grinder.

ances and fine finishes as those possible with a diamond wheel. The finished surface presents no scratches, feather-edges or heat checks.

The new tap chamfer grinder of the Edward Blake Co. sharpens right or lefthand taps with 2, 3, 4, 5, 6, 8 or 10 flutes. It can be used to sharpen the lead on reamers, countersinks, and three and four-flute drills. The machine is self-contained and independent of all other machines in the shop. A diamond dressing attachment is mounted in place at all times and the work head is provided with double cone bearings that can be adjusted to take up wear. The tap chamfer grinder dresses any tool that requires chamfering with any radial relief.

Federal Products Corp. is showing two working gages for use with grinding processes. Arnoldair is a new aid to accuracy in cylindrical grinding. Used with the Dimensionair and the Arnold Grinding gage, a high magnification results and gives the operator confidence to grind to size. The new Electric Grinding Gage automatically controls the wheel feed mechanism of cylindrical grinders so that every piece can be ground to the correct size. The new unit features visible switching contacts, a splash-proof case and a protective shield for limit setting screws.

The Gray-Grimes Steady-Rest, to be shown by Last Word Sales Co., is designed for outside diameter grinding. There is an angular shoe that supports the workpiece with a constant pressure regardless of the amount of stock removed. As stock is removed, the shoe is advanced by a cam actuated by a counterweight. With this steady rest, a shaft can be ground through its entire length without having to straddle a three-jaw rest.

Aside from a glamorous pink color, the new abrasive in the RAA grain wheel of Precision Grinding Wheel Co. is reducing grinding costs. The new wheel cuts free and fast, is sharp and holds it shape. The RAA grain wheel is made in sizes from small vitrified internal wheels up to wheels 36 inches in diameter. In addition, all mounted points, segments and cylinder wheels can be produced with grain sizes ranging from 20 to 180. These wheels have given good results when grinding high-speed steel, vascoloy, vanadium and other hard alloys.

Now out of the experimental stage, the Macklin Sales Co. MM wheel has been used on a production basis for several months in grinding carbide tools. The wheel is made with a fine loose abrasive embedded in pellet form throughout the wheel. As the tool is applied to the wheel, loose abrasive is constantly between the tool and the wheel. The main body of the wheel is somewhat harder than those normally used for carbide. The fine grain pellets lead to good surface finish and the hard body resists grooving.

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A new principle in abrasive metal finishing and light stock removal, the Grind-O-Flex wheels to be shown by Griffith-Raguse & Co. are made up of abrasive leaves interleaved with blank strips. As the grit wears out, the backing material wears too so that a new abrasive surface is always presented until the wheel is completely worn out. With the proper arbor, these wheels can be mounted on any standard plain or threaded shaft, or they can be chucked. The wheels can be used for deburring and removing die marks. Wheels are 1-inch wide and 6½ inches in diameter.

The Perfex Gage and Tool Co. will exhibit the latest model of the Tangi-Matic dresser for surface grinding wheels. Incorporation of a removable arm now permits the use of extensions so that large diameter wheels can be dressed.

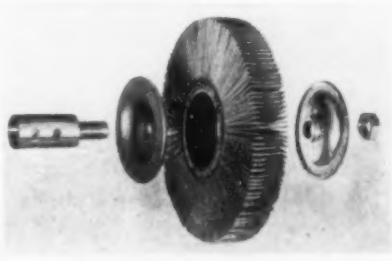
Another line of accurate angle tangent to radius wheel dressing units will be displayed by the Last Word Sales Co. Two new models have been added to this line. One is a small model to fill the requirements of dressing bench surface grinders with slight table travels. The Model B will handle a male radius up to one inch and a female radius up to and including two inches with ¾ inch of tangent travel in either direction. The Model C is the same size as the standard model but has a tilting action that makes possible the dressing of compound angles encountered when grinding form tools.

Nonskilled employees can produce surface finishes to 1½ microinches, rms, with the Model 200 centerless lapping machine to be exhibited by Size Control Co. No special skills, costly set-ups, ring laps or special tools are needed with this equipment. Tolerances of 0.000005 inch can be held.

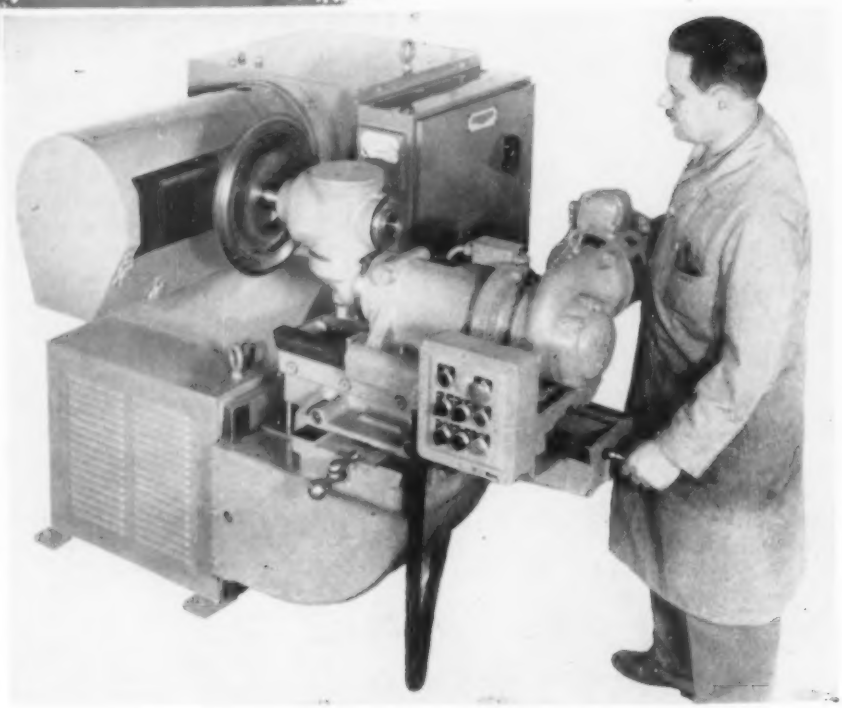
The centerless lapping process has three advantages over the common ring lapping method. There is no parting line, no time is lost chucking and unchucking the work, and no time is expended in making, storing and renewing lapping rings. Work can be placed on the machine, lapped and removed without stopping the machine.

The Model AL honing machine to be exhibited by Superior Hone Corp. can be set to operate at any speed between 250 and 1150 rpm. Operator's hands are free because the disk-type clutch and brake is foot-controlled. The machine accepts standard mandrels from 3/16 to 3 inches without adapters.

Adapting the benefits of power brushing to automatic operation, the Brushmatic No. 4, developed by The Osborn Manufacturing Co., requires the operator only to mount the gear on an arbor, start the cycle and remove the finished gear. The machine presents and rotates the gear against the rotating brush faces. After a predetermined time, the gear is withdrawn 7 inches for unloading and the machine stops. Burrs and feather edges are removed and surface junctures are blended. The brushing spindle speed is 1750 rpm and the hollow, work-holding spindle



Grind-O-Flex wheel is easily changed.



The Brushmatic No. 4 cleans gears on an automatic cycle.

rotates at 30 rpm. The head can be rotated 180 deg in both horizontal and vertical planes to obtain any desired compound angle.

American Wheelabrator & Equipment Corp. will introduce the new Model 30 Liquamatte wet blasting machine at the exposition. This machine is used for precision cleaning and finishing operations on small parts. It is for use with parts that can be lifted and handled manually, and which are capable of going through the 22½ x 19-inch door. Cleaning is done by fine abrasives suspended in water; the slurry being directed at the work through a nozzle. The machine can prepare and clean all types of surfaces and can maintain tolerance of 0.0001 inch when required. Grit size can be changed easily with no carry-over of one size to the next operation.

Cold solvent metal cleaning machines will be displayed by Graymills Corp. Such machines are used in production to prepare surfaces for subsequent operations and are also used for maintenance cleaning. They offer a low-cost, safe, convenient method for removing oil, grease, metal chips and dirt. Such machines offer one of the most practical methods of removing oil covered chips from blind holes.

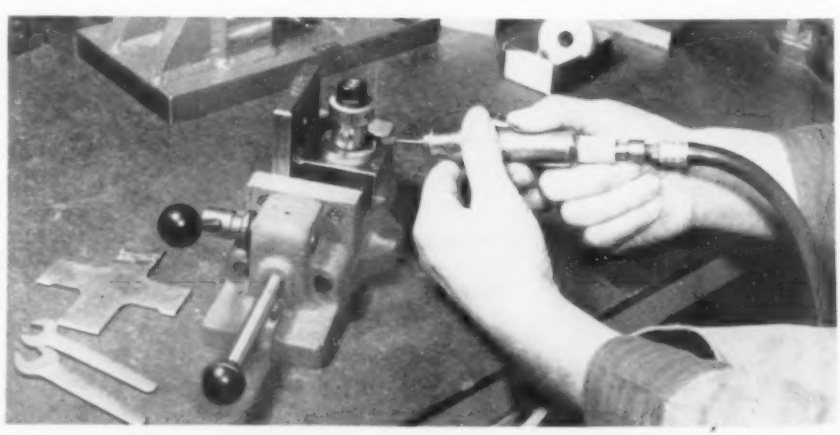
Barrel tumbling equipment and finishing compounds are to be displayed by Tumbling Sales & Service Co. The Esbec Bench Twin is a double-barrelled unit that can be used for production work on small parts or for pilot process set-up for larger parts. Mounted on a special bench, wet tumbling can be accomplished without spilling water on the floor. The Esbec Super Twin has pillow blocks on both sides of the drums so that there are no overhung loads. This increases the capacity of the unit and reduces the strain on the drive. Tumbling Sales has color coded barrel finishing compounds with colors that approximate the pH characteristics of the compounds. The colors give an indication of whether a specific compound is acid, neutral or alkaline. Drums are banded and labelled with the distinctive colors. These concentrated finishing compounds are for cleaning, degreasing, deburring, brightening, burnishing and polishing.

Portable Power Tools

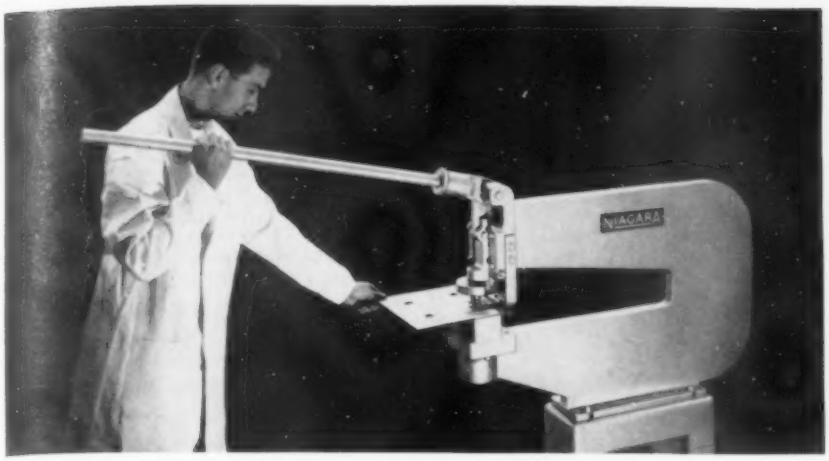
The Rotor Tool Co. is going to show the new DO-3 pencil air grinder. Powered by a 3-bladed motor rather than a turbine, the grinder weighs only 13 oz and has a free speed of 40,000 rpm. The DO-3 is 5¾ inches long, 1 inch in diameter and uses a ⅛ or ¼-inch collet. This unit fills a need of die and pattern shops, industrial toolrooms and other plants for a highspeed grinder that has power at the high speeds. Not only is metal removed faster, but the finish is better, and the burrs and mounted points last longer. A collet guard protects the operator's fingers and the tool is controlled by a sleeve throttle on the grinder.

The Precise Super 30 grinder-miller packs 45,000 rpm and ⅕ hp in a 35-oz portable tool. Exhibited by Precise Products Corp., this tool can use midget tungsten-carbide mills and removes metal ten times as fast as with grinding wheels, and leaves a surface finish below 10 microinches, rms. The draw-type collet used in this tool reduces the nose diameter to ½ inch and allows full visibility. This tool is frequently mounted on machine tools to do a specific small-diameter job. The Precise Super 30 is air-cooled and vibrationless. Built-in fuse protection insures safe operation and faulty brushes will stop motor.

Rotor Tool Co. will also exhibit an impact tool, the Rotor J-2 wrench. This wrench weighs 3 lb. and bails are available if suspended tools are desired. No impacts are made by the clutch until the fastener starts to seat. The unit has a ¼-inch rated capacity for nuts, bolts and cap screws. Reversing action is obtained by turning a knurled knob under the trigger. The wrench gives 2 blows per revolution or 2100 per minute. Few parts are used in the design of this tool, some of those used can be interchanged and others can be turned over for extra life. Accessories, such as screwdriver bits for all designs of screw heads, six and eight-point drive sockets, universal joints, quick-change chucks and socket adapters, increase the utility of this power impact tool. Specifications are the same for the hand and bail models, except for length and weight.



Rotor DO-3 grinding weld on a tool fixture.



Niagara deep-throat punch can also be set up to shear.

Manual Forming Tools

Capable of handling a large variety of work, the No. 5-24 deep-throat lever punch and shear will be shown by Niagara Machine & Tool Works. With a 5-ton capacity and a 24-inch throat, this machine is suited to the needs of industrial sheet-metal shops, maintenance departments, and experimental and model shops. It can be equipped as a punch, a shear or both. The machine shears from front to back or left to right and can slit unlimited lengths of 48-inch sheet down the center.

O'Neil-Irwin Manufacturing Co. is going to exhibit a new 24-inch hand-operated press brake. The machine is rated at 8 tons capacity, having a cam-lever mechanism that provides ample power for many forming operations. A ratchet drive greatly multiplies the power when forming heavy materials. Capacity of the brake is 16-gage mild-steel sheet across the full width of the brake or 10-gage mild-steel sheet across a 12-inch forming width.

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The Di-Acro roller is also being shown by O'Neil-Irwin. It is a small manually operated forming machine that can be used for experimental or production operations in sheet metal. A cam-actuated idler roll makes possible the formation of perfect circles in sheet material with just two passes through the rolls. Because of the same idler, bends can be located at any point along a sheet. Straight sections can be on one or both sides of a bend. Rollers are available in eight models with forming widths from 6 to 42 inches.

A new Di-Acro spring winder to be announced is a complete self-contained unit with a special cutoff lever built into the machine. This machine was developed to avoid special orders or costly delays, and it can be used to form individual springs instead of using automatic machines on a short production run. Any gage of wire to $\frac{1}{8}$-inch diameter can be wound into extension, compression, torsion and flat springs. Round, flat, square or rectangular shaped stock can be formed into springs of any length. Through use of a tension lock in the design of this winder, springs can be accurately duplicated.

Indexing and Dividing Heads

The Whirl-Dex Co. will show a unit for sine-bar indexing. This unit can be used either to help in the manufacture of special tools and gages, when they must be ground accurately, or the inspection of gages requiring accurate indexing. Through the use of the rotating 3-inch sine bar, any series of index spaces can be set up or measured. Any angle can be indexed with an accuracy of 5 seconds. A keyed adjustable 90-deg locator, a V-block and a hole through the spindle increase the utility of this equipment. Components are lapped for precision and, by reversing the unit, radii up to 18 inches can be accurately ground. Models have faceplates of 6 and 16 inches in diameter.

For combination angular and straight line cuts on shapers, milling machines and grinders, South Bend Lathe is showing a new universal table. When used on a drill press, it accurately spaces drilled holes and, by chucking an end mill, the drill press can be used as a light mill. Upper and lower tables are identical and the upper table can be removed when it isn't needed. Both slides have a travel of 4 inches and completely revolve on graduated swivels. The feed screws are equipped with micrometer collars.

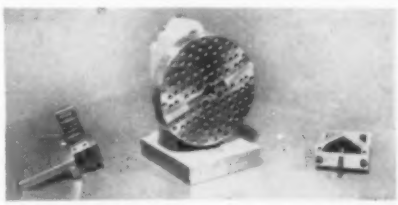
Mechanically driven by a standard rotary air motor, the AM-14 Geneva

motion index table will be shown by Precision Detroit Co. This unit has an accuracy of $\pm$ 0.001 inch on an 11-inch work circle. It can carry a load of 500 lb. within the diameter of the index plate, 14½ inches. Indexing time is $\frac{2}{3}$ second with the standard 1200 rpm motor. Time for indexing is double in skip station units. Units are available with 3, 4, 6, 8 and 12 stations, and 300, 600 or 1800 rpm motors can be specified. Power is applied to the Geneva spindle through a worm and the unit locks itself.

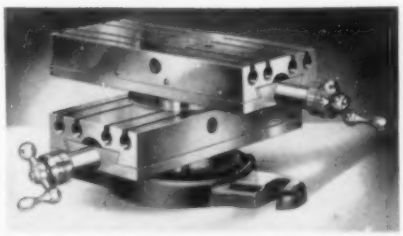
Developed to meet the demand for precise angular spacing, the Model 2 rotary table will be exhibited by Moore Special Tool Co. High accuracy is achieved through a nondisengageable, thread-ground worm in combination with an accurate mating gear. Performance accuracy of the table is $\pm$ 6 seconds throughout the entire 360 deg. The table weighs 125 lb., has a working surface diameter of 10 $\frac{7}{8}$ inches and vernier graduations of 5 seconds.

Erickson Tool Co. will exhibit a new model of the speed indexer. A shock control mechanism has been added that reduces wear from shock, prevents overriding and insures smooth operation. Standard index plate gives 4, 6, 8, 12 or 24-position indexing. Other division can be secured by using special attachments.

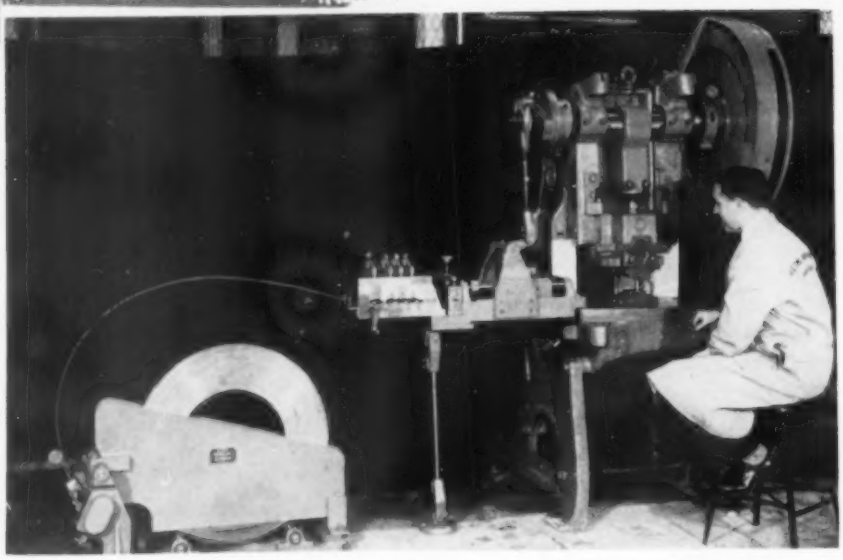
The new Abwood universal circular dividing machine, shown by Engis Equipment Co., precisely divides all circular parts whether the divisions are produced on an internal or external circular diameter, on a flat disk or a cone. Operation is automatic for production work and can be manual for dividing individual parts. Graduations machined by this unit can be preset for different lengths up to ¾ inch.



Whirl-Dex sine bar indexing.



South Bend universal table.



With other auxiliaries, U. S. coil holder makes press automatic.

Divisions from 20 to 2880 over the full circle are made directly from two built-in masters; one with 360 teeth, the other with 200. Absence of gear trains insures continued accuracy. Graduations can be formed by high-speed steel, tungsten carbide or diamond tools, or by an electric etcher.

For precision inspection and production work, the new Matrix screen-reading dividing head shown by Engis Equipment Co. offers a rapid means of achieving or inspecting angular displacements. It is capable of direct readings to 12 seconds of arc and readings can be estimated to 3 seconds. The unit has a spindle supported on lapped bearings on which a graduated glass disk is mounted. The optical unit incorporates a lamp which, through a lens system, illuminates the divided scale on the glass disk and projects the readings on a glass screen. With this direct vision, fixed focus principle, errors caused by parallax are avoided and all operators will agree to the setting. The unit has a No. 3 Morse taper center and can be mounted on a base with a tailstock.

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Ercona Corp. will exhibit a Carl Zeiss optical dividing head. This instrument is used in the manufacture and checking of index plates, gears and similar precision parts. Its accuracy of measurement and division is independent of the motion mechanism. Another design feature is that an angular value for the next operation can be set in minutes and seconds while the current operation is being done. The spindle can be tilted within a range of 90 deg, measurements can be made around a complete circle and the scale microscope reads to 10 seconds of arc on $\frac{3}{64}$-inch scale intervals.

Coil Cradles and Feeds

Adding to their line of automatic pressroom equipment, the U. S. Tool Co. will show the Model ACC-1-9-B automatic coil cradle. This cradle is equipped with two coil rest rolls and a pair of power-driven take-out rolls to unwind the material. The take-out rolls are powered by a ¼-hp motor that is controlled by a mercury switch loop arrangement. The unit is low and loading coils into it is no problem. The cradle can take coils up to 9 inches wide with outside diameters of 40 inches. Take-off can be at rates up to 52 feet per minute.

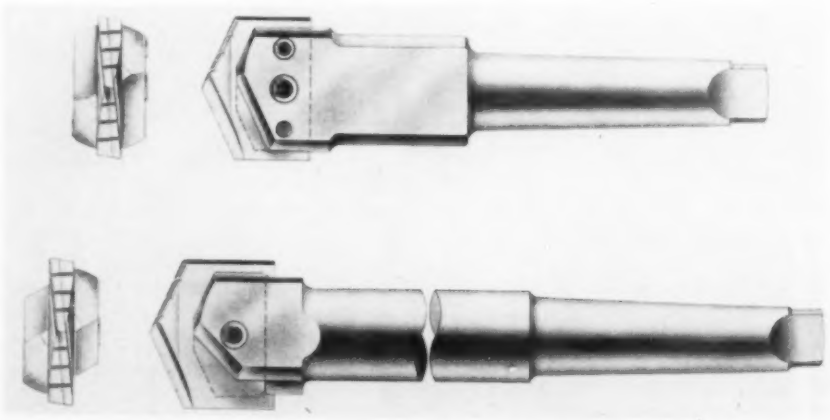
The Medelton Grip-Feed to be shown by Wm. Halpern & Co. serves a similar purpose. Coils are loaded into the cradle by rolling up slight incline. They rest on three idler rolls. Power-driven, spring-loaded pinch rolls uncoil the stock without slippage. Material up to ⅛-inch thickness can be fed to the press automatically. Since there is a slack loop to the die feed, there is no drag and, if the press is hand operated, operator fatigue is reduced. The unit will accommodate coils up to 40 inches OD, 12 inches wide, weighing 2400 lb. Uncoiling speed ranges to 100 rpm.

Rowe Machinery & Mfg. Co. will introduce the first two sizes of its new line of roll feeds for punch presses. Also to be introduced is a variation of their combination straightening machine and coil stock cradle that includes a clutch and brake assembly. This combination can be used to feed either short or long lengths to punch presses or shears.

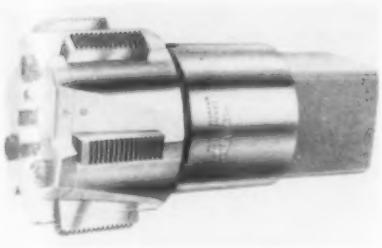
Cutting Tools

A complete line of Conner type spade drills will be exhibited by The Gairing Tool Co. These spade drills are for use in drilling accurate and deep holes. With all strength concentrated about the centerline, these drills take end thrust directly and are less subject to bending. Cutters are made of high-speed steel and the holders are made of tougher alloys. Spade drills work best when drilling from solid material and their rigidity gives results somewhat comparable to boring. Holes can be drilled at an angle to the surface. Only eight sizes of holders are needed to cover the full range of cutters; 1 to 5 inches in diameter in steps of $\frac{1}{64}$ inch. Type X cutters and holders are used for general-purpose work; type Y oil hole cutters and holders are used for repetitive, production drilling of deeper holes.

Madison Industries, Inc. will exhibit gun drills for deep hole drilling. Such drills can be used in holes with depth-to-diameter ratios ranging from 4 to over 230 with a practical diameter range from $\frac{5}{32}$ to 2 inches. For use on any machine that will rotate the drill or the work, gun drills yield holes with tolerances of 0.0002 inch and lower with good smoothness.



Gairing spade drills: Type X, top; Type Y without oil holes, bottom.



Landis solid adjustable tap.

High-speed steel and carbide step drills will be featured by the Spiral Step Tool Co. These tools can be had with either land or radial relief. These drills are specially ground in equipment that can correct errors already in the basic fluted tool. With such a corrected tool, each flute removes a uniform chip.

A new carbide-tipped twist drill with outstanding construction features will be exhibited by the Super Tool Co. The spiral on the face of the carbide tip is accurately blended into that of the drill, resulting in better chip clearance and less strain. A specially developed notch ground in the tip contributes to faster feeds and more cuts per sharpening. Feeds as high as 8 inches per minute have been obtained in cast iron.

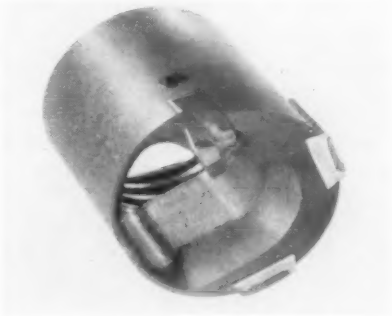
Boyar-Schultz Corp. will show a new cross slide knurling and thread rolling tool. With a self-centering design, this unit compensates for misalignment. Developed for single-spindle automatics, this tool can be used on either the front or rear cross slide. It can also be adapted to multiples, hand screw machines and turret lathes. In three sizes, the tool has a capacity range from 0 to 1¼ inches.

The Landis Machine Co. will exhibit several series of improved thread forming tools. The solid adjustable taps have been designed for high production tapping on reversing spindle machines. They can also be used on automatic screw machines where limited clearance prohibits the use of a collapsible tap. With tapered chasers, these units can tap tapered threads the length of the chaser. The improved Landmatic hardened and ground threading head has a positive locking action, provided by the new size-adjustment mechanism, and greater head strength. The 5 HH Landmatic is a stationary self-opening head and will produce threads ranging from ¼ to ⅝ inch in diameter.

New principles make possible economical thread rolling to Class 4 limits with the new Lanroll attachment for application to automatic screw machines. The new principles result in a well-balanced microstructure of the workpiece through reduced side pressures between the rolls and the threads produced. The improved attachment is available in two sizes.

The field of thread rolling possibilities is further widened with the announcement by Salvo Tool & Engineering Co. of thread rolling attachments for Fay Automatic Lathes. The attachment mounts on the back cross slide of the lathe and operates at the machine's normal spindle speed. Thread rolls in any diameter and pitch up to the capacity of the machine can be obtained and representative sizes will be exhibited.

The Lassy Tool Co. will exhibit several new accessories for their line of hand tapping and threading machines. On show will be an acorn die adapter, two sizes of Jacobs chucks and round die adapter. In addition, a quick-acting slide vise for holding work on the machines will be shown.



Madison trepanning head.

The Precision-Rol is a new development in thread generating tools and will be exhibited by the Sheffield Corp. Made by the Murchey Division, this thread rolling attachment is used on automatic screw machines and turret lathes. Outstanding features are its simplicity of adjustment and the accurate roll matching device. By using suitable rolls, it is possible to roll right or left-hand threads, annular or helical grooves, taper threads, multiple or non-uniform starts, or knurled or burnished surfaces.

Wickman Manufacturing Co. will exhibit a line of floating reamers with blades of high-speed steel or tungsten carbide (tipped). These reamers are designed to ensure accuracy of bore and concentricity. Models are to be shown for regular reaming and for blind-hole reaming.

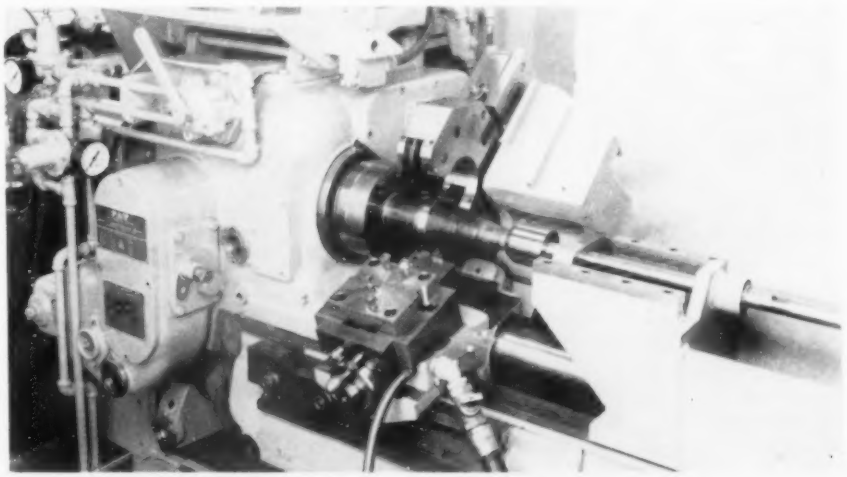
Madison Manufacturing Co. will exhibit trepanning heads that are designed so the trepanning tool is completely interchangeable and may be stocked as a standard item. One tool bit can be used on heads from 2 to 8 inches in diameter.

Four new products will be introduced by Heller Brothers Co. These are: chatterless countersinks, carbide center laps, carbide burrs and internal grinding burrs. The countersinks have been designed in both high-speed steel and carbide, and take fast cuts because of a new arrangement of teeth. The center lap can replace mounted points for lapping centers in metals parts after they have been hardened.

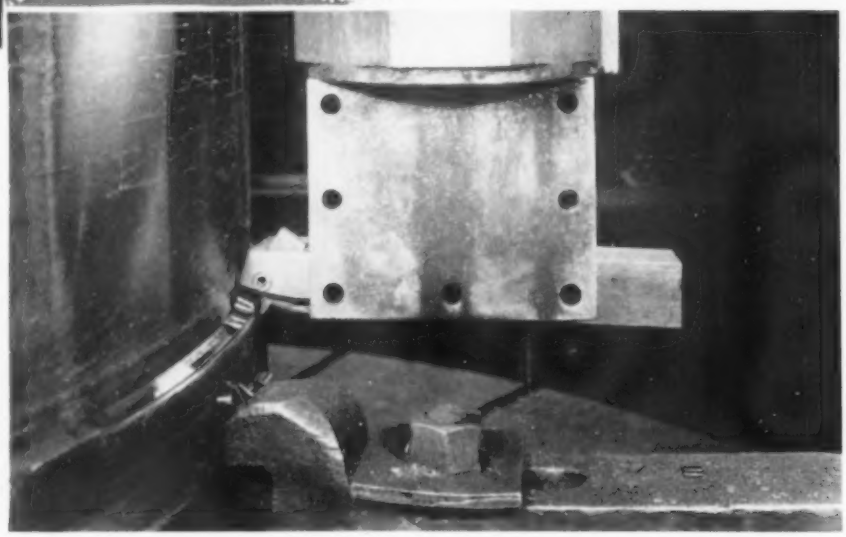
The advantages inherent in skiving tools have been built into the Hi-Helix contour milling cutters to be shown by the Douglas Tool Co. Because teeth are always in contact with the work and have a high helix angle, 65 to 75 deg, metal is sheared off smoothly. At least three teeth are always in contact with the work. With these cutters, surface finishes of 90 to 150 microinches, rms, are obtainable.

The du Mont Corp. will exhibit a wide range of special broaches that fall within the standard tooling and equipment facilities of their production department as examples of the broaches they can manufacture for quick delivery. They will show both push and pull types of broaches.

Inserted high-speed steel blade end mills, shell end mills and face mills will be exhibited by The Viking Tool



Salvo rolling attachment forming 3¼—12 threads.



Viking turning tool works on moly-vanadium steel forging at 160 fpm.

Company. Made in medium and heavy duty ranges, the blades and bodies are serrated to provide positive locking yet ease of adjustment and replacement. A semicylindrical locking wedge is actuated by a dual threaded screw so that blades can be moved without hammering.

Viking is also going to show heavy-duty inserted-carbide turning tools with mechanical chip control. The tool bit is a heavy carbide cross section with additions of serrated steel on the bottom and an extension at the rear. This design enables utilization of at least 80 percent of the carbide. The tool holder has a replaceable high-speed steel tool bit seat. The adjustable chip control block allows control without negative rakes or ground-in chip grooves. Positive top side rake permits heavy cuts without excessive power consumption. This combination can cut $\frac{7}{8}$ inch deep with feeds of 0.050 inch at speeds of 200 sfm.

Gritcloth is a new abrasive material that will be exhibited at the show by Bay State Abrasive Products Co. It is an open-mesh fabric that holds abrasive grit firmly in a grid that cannot load. Removed stock flows through the holes and life of the product is 10 to 15 times that of sandpaper. The material can be used wet or dry, flat or folded, on sanding machines or by hand, and can be used on either side. It can be rinsed in water.

Cutting Tool Components

Developed for extremely difficult machining operations, two new premium grades of carbide will be shown by Adamas Carbide Corp. Grade 434 is for steel roughing cuts—including interrupted cuts—with heavy feeds, and Grade GG for interrupted cuts on steel where extreme shock and vibration are encountered. Adamas will also show a new preformed blade with a helix formed in the face and a helical clearance formed on the top of the blade. The back and bottom of these milling cutter blades are flat so they can be brazed into a straight axial gash pocket. New carbide drill tips for twist drills will also be shown. These were designed especially for drilling cast iron and nonferrous materials, and have a new flute shape to blend with the 15-deg helical flute of the heavy service drill body.

A new technique permits Adamas to preform carbide blanks for hobs to close tolerances. Blanks are preformed with necessary clearance and lead angles. Intricate shapes can be preformed instead of having to be ground from solid carbide blanks.

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The Sandvik Coromant Div., Sandvik Steel Inc. will exhibit their new line of standardized tungsten-carbide tipped tools and blanks. Coromat carbides are available in six grades covering all tooling requirements.

Featured by A. Milne & Co. will be a new line of high production flat ground stock. This high-chrome, high-carbon air-hardening tool steel is available in a range of sizes, flat ground to minimum of 0.010 inch oversize and guaranteed free of decarburization spots. They will also show two new grades of tubular tool steels. High Speed Hollow Die will be for the toolmaker and CMW Hollow Die, a chrome-tungsten-molybdenum analysis, will be for the die-casting industry. Tools made from these materials will also be on display.

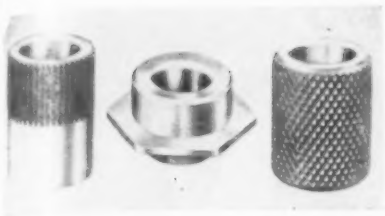
The du Mont Corp. will show a new line of high-speed rectangular ground tool bits. These new bits are made with blended and balanced carbon and vanadium to produce a fine grain structure. They are heat treated to Rockwell 66-68 C and are ground to close tolerances without carburization. Wear resistance, toughness and heat resistance qualities have been balanced in these new materials. These rectangular ground tool bits are available in 18 sizes ranging from $\frac{1}{4}$ x $\frac{3}{8}$ x 3 to $\frac{3}{4}$ x $1\frac{1}{2}$ x 7 inches with square ends.

The Latrobe Steel Co. will exhibit XL Desegatized high-speed tool steels. During preparation of this material, carefully controlled amounts of sulphur are added to form alloy sulphides in the metal. These sulphides do not affect chip formation but provide an internal lubricant that reduces friction during cutting. Cutting edge strength is not impaired and these steels have the same physical properties as similar unsulphurized grades. The XL steels are available in four types: M-1, M-2, M-3 and M-10. They will be available as semifinished bars, forgings, drill rod, bits and turning tools.

American Coldset Corp. will display various types of formed diamonds that can be used to produce shapes. Those shown will be representative of the types of forms that can be produced on an 8-head machine. Quicker and more accurate forming of the diamonds can be done by machine than by formerly used hand methods.

Diamond dressing tools will be shown by United Diamond Tool Corp. for use on Type ZA Reishauer gear grinding machines. The tools are used in pairs for dressing the wheel and, because of the accuracy required of gears produced on this machine, these new dressing tools must be held to 0.00005 inch.

Gritcloth can be used on metal or wood and will not load.



Three new American drill bushings.

Noncutting Tool Materials

American Drill Bushing Co. will exhibit three new types of drill bushings. The new Serragrip bushings are made especially for use in Fiberglas, wood, plastic, Masonite and soft metal tooling. The bushing can be pressed into soft materials without shearing. Serrations on the bushings prevent rotation of the bushing. The Deltagrip and Hexagrip bushings are made for use in castable materials. The Deltagrip has a completely knurled external surface and the Hexagrip has a hexagonal section to prevent rotation.

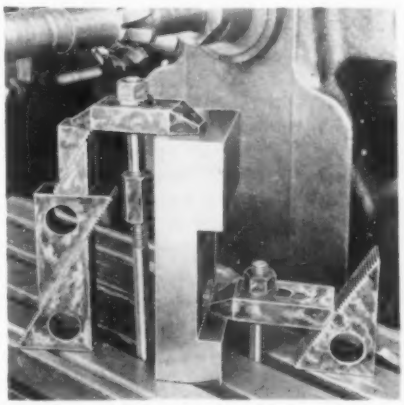
With 0.002 to 0.004 inch of bronze electroplated on the inside diameter, guide bushings to be shown by Lamina Dies and Tools, Inc. combine long-wearing service of steel with the free action of bronze. As a further aid to smoothness of action, all of these bushings have a 5/32-inch wide oil groove machined into the inside wall. The bushings are positioned in holes in the die shoes with wring fits and are securely held by three different types of retainers. The three types of bushings are: nut, toe clamp and ring.

Standard Parts Co. is showing a new line of sure lock milling fixture keys. Key way slots are not needed with this key, and fixtures using them can be used on any available milling machine. If keys are not the right size, they can be replaced by ones that fit the table slots of the machine. They can be tightened into the fixture from either the top or the bottom.

A new type of strap clamp will be exhibited by Northwestern Tool & Engineering Co. Serrations on the heel of the clamp work directly with the serrations on Northwestern step blocks. These will be available in a complete line up to ¾ inch diameter in lengths of 2½, 4 and 6 inches.

For applications where the principal requirement is for the greatest weight in the smallest space, lead has frequently been used. However, because of its low structural strength it has been limited in application. Two new materials will be shown that expand the use of heavy metals. Firth Sterling will exhibit their Heavy Metal which contains up to 95 percent tungsten. Metal Carbide Corp. will exhibit their Talide alloy, which is also a tungsten-nickel-copper alloy. Pure tungsten, almost twice as heavy as lead, cannot be used because of the difficulty in its manufacture. The pure metal cannot even be handled by powder metal techniques to achieve large pieces of maximum density. Because of its good corrosion resisting properties, tungsten was highly desirable for use where heavy metal parts were required.

By adding minor percentages of nickel and copper powders, powder metal techniques can be used and the resulting material is up to 60 percent heavier than lead and has the tensile strength of good quality steel. These metals are machinable by standard methods and with ordinary equipment, and can be brazed or silver soldered. It can be used for counterweights and balances, electrical contacts, vibration dampers, flywheels, and dies, mandrels and anvils for hot extrusion and upsetting. Firth can supply parts up to 20 inches in diameter by 18 inches high, or equivalent volumes up to 3500 lb. Talide can be had in diameters up to



Serrated Northwestern strap clamp.

25 inches or lengths up to 40 inches with weights up to 1000 lb.

Enco Manufacturing Co. will introduce a complete new line of precision magnetic base test indicator holders and lights. Called Tiny Titans, these units have permanent magnets that exert pulls of 65 and 125 lb. They can be mounted on rounds down to ¾ inch in diameter as well as on flats. The ball swivel is of brass and the stem is nonmagnetic to isolate the base. Various accessories are available for holding indicators, lamps and magnifying glasses.

Uni-V-Blocks are made of forged, close-grained chrome alloy steel selected for its properties of hardenability and stability. After heat treating these blocks, the Precision Tool & Manufacturing Co. cools the blocks slowly. When they are sufficiently cool, the blocks are then subjected to a deep-cold process that renders them permanently dimensionally stable. These blocks are made in 3 styles.

The Multiplex is a new general-purpose angle iron to be introduced by The Taft-Peirce Manufacturing Co. Valuable in processing, tool and die work, these irons can frequently avoid multiple set-ups and reduce handling. These irons are made of high quality cast iron, carefully normalized, and all surfaces are scraped. Working surfaces are square within 0.0005 inch in 6 inches and parallelism of respective sides is held to 0.0005 inch. Both the base and the angle are ribbed to ensure rigidity. The standard size weighs 95 lb and measures 12 by 12 by 12 inches.

Free machining, air hardening Olympic FM is a new die steel to be shown by Latrobe Steel Co. This material is produced by the Desegatized process that cuts machining time by as much as 50 percent without altering the physical properties. This material is comparable to the regular Olympic high carbon-high chromium die steel.

Formula 921T is a cast aluminum tooling plate and bar to be shown by Pioneer Tool Engineering, Inc. This material is especially useful in the aircraft industry where tooling fixtures are large, and where it is desirable to have

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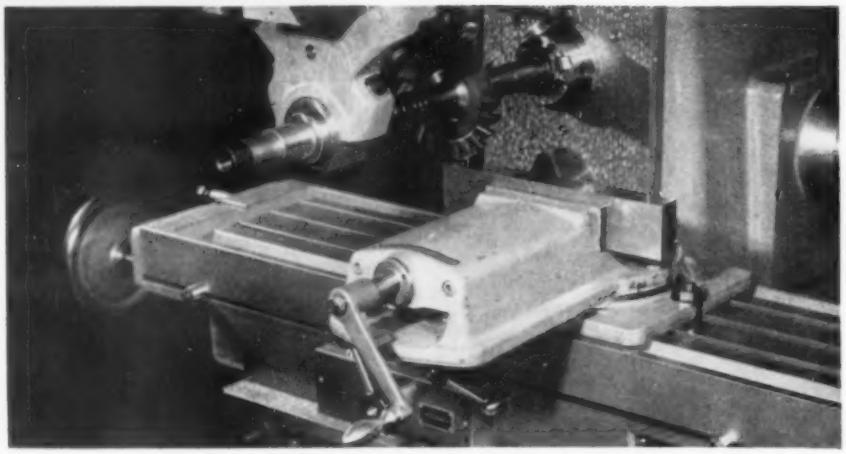
the same coefficient of expansion in the tooling as in the material being worked. Cast machined aluminum plate shows none of the creep or distortion found in rolled aluminum plate. This material is heat treatable if desired and it can be welded. The plate comes in standard sizes of 48 by 96, 48 by 120 and 48 by 144 inches, and special sizes up to 144 inches long are available. Thickness is from ⅜ to 6 inches (bar to 8 inches). This aluminum grain structure is improved by titanium additions.

The Chemical Development Co. is going to show Devcon, the plastic metal. With an initial consistency like putty, the material contains 80 percent steel powder and 20 percent plastic. It can be used to make permanent drill fix-

Tiny Titan magnetic base.



Hydrovise has a closed hydraulic clamping system.

tures, jigs, forming and drawing dies, holding devices and models. It hardens, without heat or pressure, in about two hours. It neither expands nor contracts on hardening and can be worked with conventional metal-working tools. If desired, it can be plated with chromium, nickel or copper. After setting, it has the following properties: tensile strength, 10,000 psi; compressive strength, 15,000 psi; flexural strength, 13,000 psi, and impact strength, foot-pounds per inch of notch, Izod 0.7-0.8. The formed material resists most solvents, acids and oils.

Toolplastick L-900 laminating resin and L-910 Gelkote are nonshrink thermosetting modified epoxy resins of excellent stability. To be exhibited by Rezolin, Inc., these materials are used in making many types of jigs, fixtures, tool masters, prototypes and models. In general, the laminating resin is used to impregnate glass fabric to form the body of the fixture and the Gelkote is used to produce an extremely smooth surface. When the tool is constructed over a form, the Gelkote is applied first.

Workholding Devices

A new self-contained hydraulic vise known as the Hilma -Hydrovise will be exhibited by American Tooling Corp. This tool has no pump, hoses or tubes to limit its application. This vise combines the elements of a mechanical vise with those of hydraulic power transmission. When the handle is turned, the jaws close mechanically by a screw action until the object is encountered. At that point, a clutch is activated automatically and additional force is applied hydraulically. Up to 8,750 lb can be applied, but once the hydraulic system goes into operation the movable jaw can advance only $\frac{1}{32}$ inch so that even thin-walled castings will not be damaged. Jaws are 2 inches high and $6\frac{9}{32}$ inches wide with a maximum opening of 5 inches. With a swivel base, it weighs 120 lb. Other sizes are ready for production.

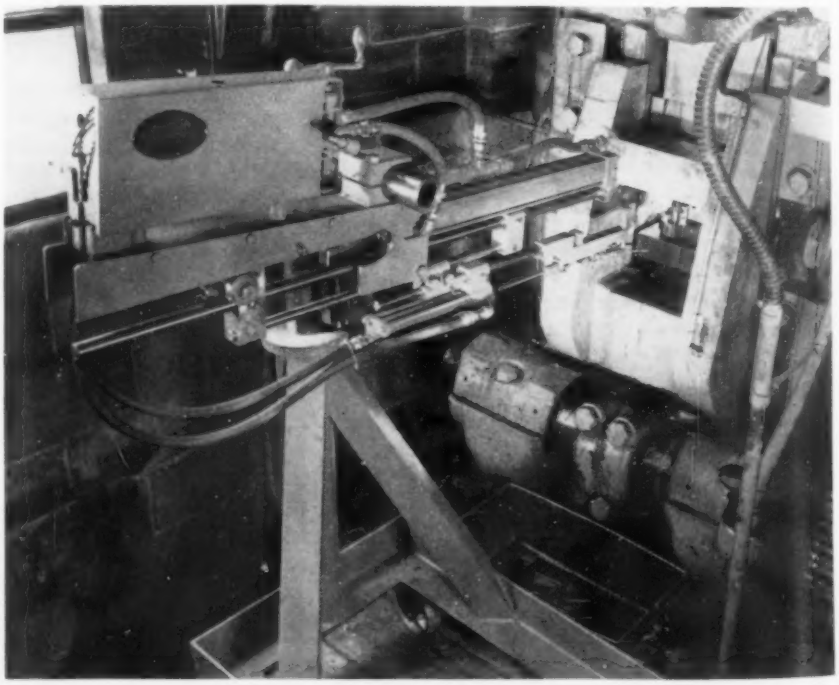
Wilton Tool Mfg. Co. will announce a complete line of power operated vises under the name of WiltOmatic. Through use of a conventional vise screw, the movable jaw is brought to the work surface. The power unit has an adjustable power stroke from 0 to $\frac{3}{4}$ inch. Maximum jaw opening varies from 3 to 9 inches depending on the size of the vise. The power stroke can be operated by foot or hand control. Relatively low pressure plant air operates an air-hydraulic conventor to give the locking force which varies from 1250 to 6000 pounds.

The Cushman Chuck Co. will exhibit a new pinch type chuck and face plate jaw. Because of its two-piece jaw construction, it can be used with soft blank top jaws machined as required for special holding jobs. The holding problem that these new pinch jaws solve is that of permitting work to be accurately positioned and centered without danger of distortion and then firmly gripped for machining without either distortion or change of position. When one jaw contacts the work, it stops until the other one also is in contact. Then both jaws tighten with complete compensation.

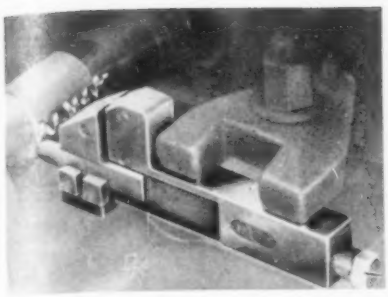
Using special alloy magnet materials, Superpower permanent magnet chucks to be exhibited by The Taft-Peirce Manufacturing Co. can be used for surface grinding and light machining operations. Holding power can be controlled and, because electricity is not used, the chuck operates without heat. Taft-Peirce will also show magnetic parallels and V-blocks that can be used when it is desired to carry a chuck's magnetic holding power above the face plate level. These accessories are constructed of alternate laminations of brass and soft iron of high magnetic permeability. Laminations are joined by nonmagnetic through rivets.

Sahlin Engineering Co. will exhibit its recently designed self-contained floor type unloading machine. Designed for the automatic unloading of small (it can pick a penny off of a table), and medium size parts, it can be supplied with a fixed or rolling base. Jaw assembly, electrical controls and air cylinders are similar to those used on standard Sahlin swinging arm unloaders.

A new compensating chuck will be shown by The S-P Manufacturing Corp. This power chuck is intended to hold rough forgings, out-of-round castings and finished pieces with irregular surfaces, and at the same time provide equalized gripping force by each jaw.



A Sahlin unloader picks parts from a die.



Recoiler tool holder.

Design of these two and three-jaw chucks is such that when one jaw contacts the work it stops moving until the others contact the work. When all jaws are in contact, they close with uniform force exerted by each jaw.

Ideal Industries, Inc. will show a new live center model, the Universal. Twin roller bearings are preloaded after assembly and then the point is ground in its own bearings. This technique limits eccentricity tolerance to ±0.001 inch. A double seal is designed to keep coolant and chips out and grease in. Centers are available in six speed ranges and with four Morse tapers.

Tool Holders

A new tool holder that absorbs vibrations and shocks occurring when turning rough surfaces or other than round work will be shown by American Tooling Corp. In addition to absorbing shocks, the Recoiler maintains a constant cutting angle. Carbide bits can be used in this holder for operations that would break them if held in rigid holders. All shocks and vibrations are transmitted to and absorbed by a rubber spring pack located in the shaft of the holder. The head of the holder is connected to the body by a parallelogram linkage so that the cutting angle is constantly maintained.

A new toolholder system developed by Vascoloy-Ramet Corp. will be on exhibition. Elimination of chipbreaker grinding and reduction of carbide waste are made possible by a new vertical toolholder and two new lengths of carbide inserts. The toolholder has a built-in carbide chipbreaker and its design permits using all of the carbide insert. The two new carbide inserts are a half length ¾-inch long size and a throwaway size. The latter is for use of all cutting edges without grinding.

Metal Carbides Corp. will show mechanically mounted Klamp-Lok H-style holders for inserts. Buttress serrations lock the carbide blank firmly in place but allow adjustment side-to-side and a built in adjustment screw enables adjustment forward and backward. The horizontally clamped insert can be ground many times before a new standard size blank is needed.

A new line of self-releasing tap holders will be shown by the Erickson Tool Co. They will cover a range of standard hand taps up to and including 2-inch sizes and pipe taps up to 1¾ inches. One model is a flange type with limited float for use on turret lathes, another is similar but without the flange for use on automatics and the third is full floating to correct for both angular and parallel misalignment.

To satisfy a need for a better interchangeable counterbore drive with interchangeable pilots, the Falcon Tool Co. has developed the T.I. (taper interchangeable) Drive. It has a taper with practically no overhang and the cutting portion of the tool is ground true with the taper so that each tooth does the same amount of work. Cutting tools can be changed simply with a twist of the wrist.

R. B. Tool Co. will introduce a line of Bilz tapping chucks. These feature an adjustable safety friction clutch, length compensation and axially parallel floating action. These chucks can be used without time-consuming alignment of the tap with the center of the hole and threads can be tapped to the bottoms of blind holes without fear of breakage.

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The Logansport Machine Co. will hold its first public showing of its patented, new P.R.O. (power release only) chuck at the Exposition. This chuck will remain locked in the closed position until it is positively opened by the operator. The design of the chuck is such that when centrifugal force, which would tend to open the jaws, is highest, the locking force is the greatest.

Optical Set-Up Equipment

Two new Brunson optical tooling instruments that make it possible to reduce errors in alignment to one-half second of arc will be shown by Charles Bruning Co. They are designed to establish and maintain a vertical plane for setting points accurately, and gage wear in tools and dies. The instruments are a jig transit in two models and an optical transit square. The jig transit has a mirror mounted on the end of the telescope axis, paralleling the line of sight, and an adjustment to center the line of sight directly over the spindle.

The optical transit square resembles the jig transit but has a hollow axis. One end of the axis is enclosed by a clear window, the other by a partially

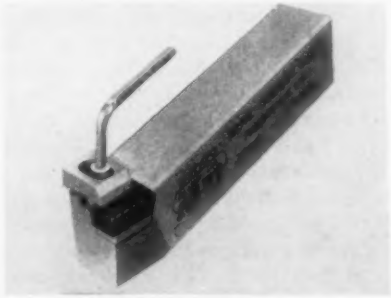
coated window that is both transparent and reflective. A number of optical squares can be set up on the main line of sight and because of this, more crews can work on one set-up than would be possible with jig transits. Because of its hollow axis, the square can be plunged 180 deg at any time to check its accuracy.

Engis Equipment Co. will show the Taylor-Hobson sweep optical square. This unit provides the most accurate method of sweeping a horizontal plane. The telescope is vertical and the sighting line is turned exactly 90 deg by a pentagonal prism. A built-in micrometer is included for measuring height variations of the target in successive positions. The fixture is levelled by two adjusting feet pivoted about the third foot.

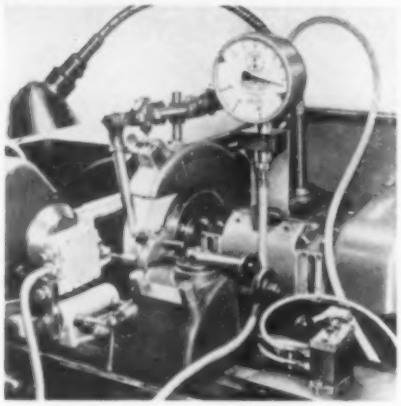
Watts machine tool scale projectors will also be shown by Engis Equipment. Scale projectors offer high standards of accuracy that are not diminished since they are not subject to wear. They use magnification and can be viewed with both eyes. Such scales can give an indication of creep in a process so that corrective action can be taken immediately. Also, the scale can be projected into a position from which the operator can best control the machine. Two types of scales can be used; one with continuous graduations for general use, and one that is programmed to a specific operation. The scale is ruled on metal bars—of the same material as the workpiece for long runs to avoid temperature differential effects—is illuminated by a lamp in the unit and reflects the image of the scale back to the viewer. The scale is fastened to a portion of the machine that moves.

Ercona Corp. will exhibit a Zeiss toolmaker's microscope that works on the silhouette principle. The instrument is equipped with a template showing the desired profile. This is compared against a silhouette of the work.

The Model 11 machine tool microscope to be shown by The Perkin-Elmer Corp. is designed to be mounted directly in the machine spindle or on an



Two-way adjusting Klamp-Lok.



Grinding to size with Deltameter.

offset bracket. This instrument has a magnification of 30X and a ¼-inch field of view. With it, a change of 0.0001 inch can be detected. When a full-sized template is to be used, mounting the microscope on an arm simplifies the transfer of information from the template to the workpiece. Any movements made to bring the miscroscope to bear on the correct part of the template will be duplicated by the machine.

Inspection and Correction

The R. B. Annis Co. will exhibit the under-drive moto-blower balancer Model M2-S-44/U. This unit is designed for balancing complete motor and blower wheel assemblies. Blower wheels ranging from 2 to 8 inches in diameter are driven by an adjustable under-drive belt. Production speeds can be up to 180 units per hour depending on the method of applying the balancing weights. The machine can give single plane indication, preferred position static indication or full dynamic indication. The single plane method is fastest from a production standpoint.

Using a balanced air supply that does not affect the accuracy of the instrument, the new Deltameter gages to be shown by C. E. Johansson Gage Co. have a measuring accuracy of ±0.000,-005 inch. The instruments can be used for automatic control of machines or for sorting parts. They can be used on internal and external grinders, turret lathes and rolling mills. The instrument has two built-in electrical contacts that can be used for signalling or controlling.

Quick set up and wide capacity make the new Stewart-Warner electronic industrial balancer useful for maintenance as well as production balancing. Exhibited by Merrill Engineering Laboratories, this unit can be used to balance high-speed milling heads, cutters and grinding wheels to prevent vibration marks in the work and to extend tool life. This unit can check parts weighing from ½ to 1000 lb. The part being balanced is accelerated above its resonant speed and allowed to coast freely back through the balancing zone so that readings are not affected by errors that would be associated with the drive. Because it balances at mechanical resonance, sensitivity of this machine remains the same for all weights of parts.

Inspection

The life span of a die is increased in direct proportion to the effort expended in its manufacture. The Tapermaster is a testing instrument, to be exhibited by Karl A. Neise, that insures that as the die is reground the form enlarges evenly. This instrument can be used during production of the die as well as during inspection. Testing point of the instrument is caused to follow the inside of the die openings and the dial indicator shows the exact amount of taper that is present.

The Van Keuren Co. will show a new line of chrome carbide taper insert plug gages in the range from 0.501 to 1.510 inches in diameter. Wear properties of the gage material are comparable with those of tungsten carbide and this material has the advantages of being much lighter and having a coefficient of expansion close to that of steel. These gages are available in Classes Y, X and XX.

Size Control Co. will exhibit the Grip Tester that simulates vacuum tube bases and sockets. Purpose of the machine is to provide readings for the insertion

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and extraction pressures required of male and female tube sockets. This instrument will be of especial use in the airborne electronic field where the loss of a tube because of high speed maneuvering might mean loss of control of the airplane.

The Series III Talymin gage heads, either of the axial or side acting type, require only light gaging pressure and can be operated from their standard amplifier to provide a paper record. Exhibited by Engis Equipment Co., these heads can be operated with magnifications from 100 to 5,000. The inkless record produced by electric spark can readily be interpreted. The instruments can be used to operate a relay or indicating gage to establish maximum errors or provide automatic machine control.

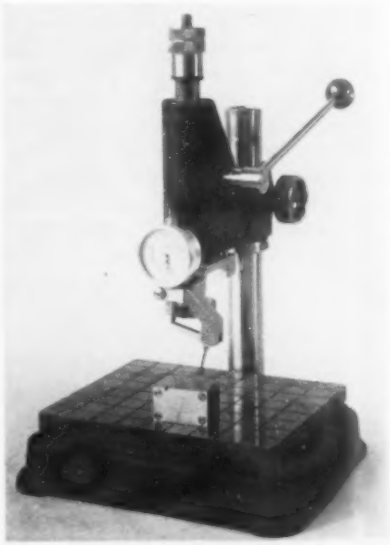
A newly developed series of motorized hardness testing machines for either standard or superficial Rockwell testing will be exhibited by Service Diamond Tool Co. The motorized components are completely shut off during the test penetration, which avoids the source of errors in previous motorized testing equipment.

A new production type Brinell hardness testing machine that fits into a roller conveyor line is the featured machine in Steel City Testing Machines' booth. A roller section reduces operator fatigue in bringing parts into testing position. As the test cycle starts, the rollers drop out of the way, allowing the work to rest on an anvil of hardened rails. Rollers automatically rise again at the end of the test.

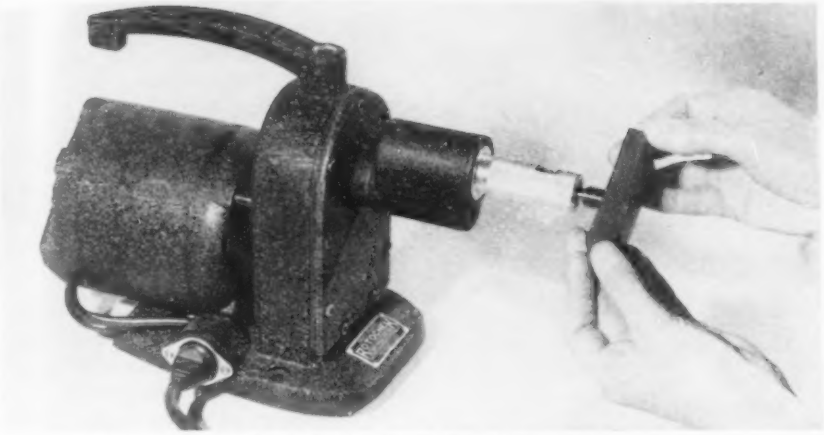
The Triflumic micrometer to be shown by Tubular Micrometer Co. is for use on three-fluted tools. This micrometer reads directly in 0.001 inch and can be used while the tool is still in the machine. True roundness of cylindrical work can also be determined with this micrometer that has a V-block instead of a flat anvil.

The Sempun magnetic Flaw detector is a small instrument for finding flaws in steel parts. It will be shown by H.E.B. Machine Tools, Inc. The detector weighs only 11 lb and is completely portable. Containing several ball joints, the two poles can be made to straddle awkward and irregular areas. Two spray solutions are used with the detector. One produces a white background for the other, which is black and indicates any flaws or cracks. Such flaws need not be on the surface but can be indicated at least 1/16 inch below.

Moore Products Co. will exhibit a standard cabinet unit for leak testing castings and assemblies at production line speeds. This equipment uses a pneumatic system that operates on the plant air supply and avoids wetting parts with the consequent need for drying and rust prevention. The measure-



Tapermaster checks dies.



Pressure starts the Rotocheck and a pull stops or reverses it.

ment is clearly indicated on a large gage and the classification into accepted or rejected parts is shown by signal lights. Output connections provide for electrical operation of supplementary sorting or marking equipment.

The Taft-Peirce Mfg. Co. will exhibit the bench model Rotochek. This gage screws into threaded work at the rate of 4 revolutions per second. Reversal of applied pressure causes immediate disengagement or reversal of the drive, as desired. This torque control is provided by an unusual clutch design. This instrument was designed to speed up the process of checking threads by manual rotation. Special adaptors are available for reversible thread plug members and for adapting the unit to inspection of external threaded parts.

A fully adjustable bore gage will be shown by the Madison Manufacturing Co. This type of gage is useful for the occasional user as well as the producer of quantity parts. A family of seven of these gages cover any diameter bore from 1.432 to 3.192 inches. After the gage is set to the proper bore, the adjusting and lock screws can be sealed with sealing wax if a production run is to be inspected.

The Sheffield Corp. will show a brand new development, an adjustable air bore gage. This is a light gage that can be adjusted to check any bore within the range of 3 to 12 inches. The design of this unit is not dependent on gears, cams or levers, which are subject to wear, and backlash and breakage are not problems. A Plunjet air gaging cartridge is the gaging element. The bore gage is essentially a kit consisting of a body, two carbide tipped screws, four extensions and two centering bars having carbide balls as contact points. These units are usually used with air gages of 1000 to 1 amplification.

To be seen for the first time is Federal Products Corp.'s new universal ID-OD gage for shallow diameters. Designated as Model 88, it is of tubular construction, free from joints, light in weight and easy to handle. The sensitive contact is mounted on a Pantograph unit that transfers the measurements to a dial indicator. The rest buttons are adjustable making it possible to change the measuring depth, and the reference contact can be moved along the tube so that various diameters can be checked.

Dial bore gages for as small as $\frac{3}{16}$-inch bores will be shown by Standard Gage Co. The new gages use the centering-size disk principle whereby a removable disk of nearly the bore size centralizes the head and at the same time serves as one of the contacts.

Affording a fast, accurate means for checking the actual space width of internal gears and splines, including helical, a new Indicator Space Width gage will be exhibited by Vinco Corp. A 0.0001-inch dial indicator is located above the pistol grip for easy reading. It is in a cup-shaped housing for protection. The operator pulls the trigger to retract the upper anvil, permitting the gage to be easily inserted in the spline or gear. The gage is then rocked slightly to find the minimum diameter. The deviation is read directly from the dial indicator.

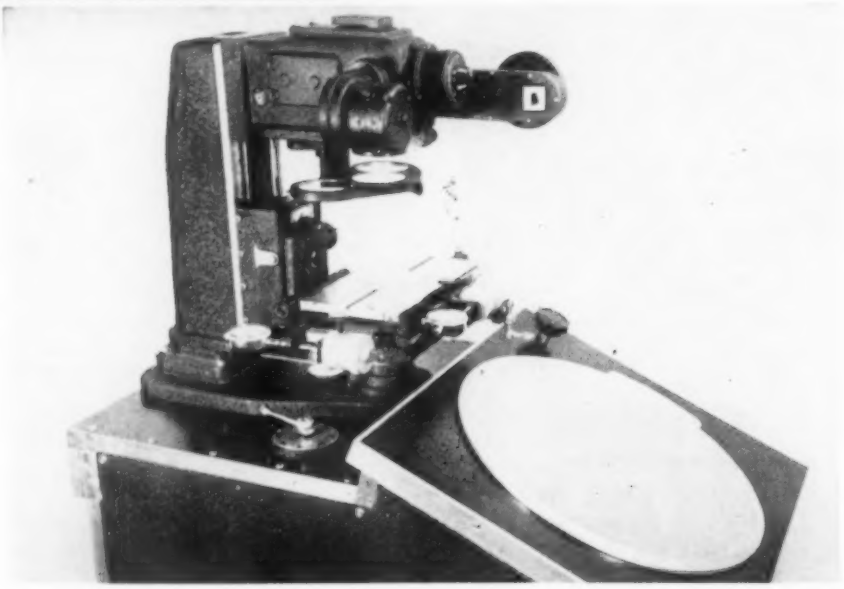
Merz Engineering, Inc. will exhibit a new recording comparator. The recording unit of the gage has been designed to operate with any of the standard pickup heads used on Merz electronic comparators, height gages or special electronic checking fixtures. The recorder is designed to record individual readings on production parts and automatically advances an eighth of an inch between each inspection cycle.

Featured by Optical Gaging Products Inc. will be a new method of gear analysis by which all elements of gear tooth construction can be inspected and gaged visually. Such visual inspection makes possible group discussion of gear element discrepancies and aids production quality control programs.

The Multimi is a new multiple interference microscope to be shown by the C. E. Johansson Gage Co. This instrument is based on a modification of interference methods and has an accuracy of 0.02 microinch, instead of 2 to 4 microinches which is the best accuracy that can be obtained by conventional methods. In the new instrument, fringes are fine lines that constitute a profile curve that exactly reproduces the surface roughness to be measured. This instrument can cover a measuring range formerly done only by the electron microscope, and is approaching measurement of atomic dimensions. The instrument can be used for crystal studies and thermal expansion experiments.

The Industrial Scientific Co. makes the Probograph, an instrument for checking and measuring machine parts. Several models of this machine will be in operation at the show. The Probograph operates almost automatically

Federal's new gage measures shallow inside and outside diameters.



The Portman Model R-300 comparator.

by means of an electric probe. Each measurement is recorded as a graph on a chart ready for use by quality control personnel. The instrument can be used both in the gage room and on mass produced products.

A new design for optical comparators will be exhibited by the Portman Instrument Co. Known as the Model R-300, this unit uses the Multi-Phase optical system that projects an upright, properly-oriented image with good definition and screen brightness. The optical system also provides for long focal lengths at every magnification so the clearance between the lenses and the object stage is always large. An indexing type lens mounting capstan makes possible instant changes in magnification. The 16-inch diameter projection screen can be studied under all lighting conditions.

The Inspection Equipment Co. manufactures master comparator charts and reproductions of masters on glass, metal or plastics. They will exhibit two types of plastic reproductions. Typo-Glass is a thin dimensionally stable sheet plastic in which the comparator chart image is impregnated. Either overlay or replacement types of charts can be used. When the plastic has cured, the sheet can be washed with a mild abrasive or soap, and immersed in warm water so that cleaning is no problem. Typo-film is a vinyl material on which comparator chart reproductions can be formed. Such charts are usually used as file copies but can be used on the comparator. They represent the least expensive type of reproduction currently available. A major advantage of both types is their light weight and consequent low shipping costs. Both materials are resistant to fracturing in transit or in use on the comparator.

The Model 118 angle comparator, to be exhibited by the Perkin-Elmer Corp., has many applications in the optical and machine shop. It is used in measuring angles, parallelism and surface quality. The comparator can be used directly against any surface that will reflect a beam of light and glass contact plates are available that will permit its use on nonreflecting surfaces. Light from an illuminated pinhole is reflected from plane mirrors and is collimated by the objective lens. The collimated light is then reflected from the surface of the object back through the

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system and imaged in the plane of the reticle. If the reflecting surface is not exactly perpendicular to the beam, the returning image will be displaced. Surface irregularities are apparent as distortions of the image.

The Van Keuren Co. will show a new monochromatic light that is compact and self-contained. The light weighs 6 lb and takes up only 7 x 7 inches of space. It can be used with optical flats up to 4 inches in diameter. Because of its small size, it can be used in production at the machines as well as in the inspection room. Interference bands in the Model MJ light have a value of 0.0000116 inch per dark interference band.

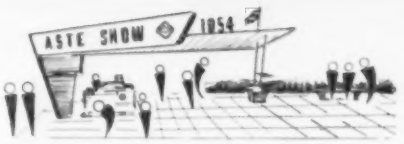
Boice Manufacturing Co. will introduce several inspection instruments at the show. A new lightweight dial indicator snap gage features full width flat anvils so that measurements can be taken close to a shoulder. This Model 12,000 is available with indicator graduations between 0.00005 and 0.001 inch. A companion to this instrument is the Model 12,001 adjustable set master. This unit is a combination reference master and gaging holder. It can be set in the gage crib and used in the shop with the Model 12,000. This instrument is a permanent but adjustable master that can be used anywhere without the fear of damaging a costly reference master. If design changes occur, the setting on the master can be changed too.

A comparator gage, equipped with a dial indicator for checking dimensions on shafts will also be shown by Boice. It offers a quick method of comparing the dimensions of a piece to those of an established master. The rests have a concave radius to centralize the gage on round workpieces. These rests permit the gage to be set up on a master that has the same form as the piece, on a gage block set up, or on another Boice set master.

Reliant Industries will show several series of new gaging equipment. Their dial indicator snap ring groove gage comes in models to check diameters from 0.240 to 5.270 and snap ring grooves for standard ring sizes -25 through -500. These gages feature self-centering three-point contact. The comparator type indicator countersink gage series covers countersinks for rivets of most used sizes and all countersinks of any angle. These units are equipped with round anvil for gaging countersinks on flat surfaces and V type anvil for gaging countersinks on cylindrical parts. These gages can be quickly set to a master or production part. After setting, the indicator gives direct readings.

Reliant will also show a series of dial indicator type O-ring groove gages. Various models check diameters from 0.250 to 4.875 inches and O-ring grooves from standard ring sizes -5 through -52. The gages are self-centering and can be

Perkin-Elmer angular comparator.



Reliant comparator type indicator countersink gage.

set directly to a master ring gage. Diameters are measured directly. A slight rocking motion in one direction indicates the minimum reading of the diameter. Gaging motion is transferred directly through a lever to the gage indicator.

The new Taft-Peirce adjustable height gage uses a reed-mounted contact in an adjustable fixture. This gage is linked to a standard CompAIRator that has a velocity type air circuit. The particular unit that will be on exhibition will have a total adjustment range of approximately 1 inch, to accommodate a wide range of heights. Magnification will be 2500: 1, with dial graduations of 0.00005 inch. The adjustable feature of these gages make them desirable in inspection operations involving parts of different heights. These gages have no indicator creep or flutter.

Another new development in air gaging, to be exhibited by The Sheffield Corp., is the air indicator in which the only moving part is the contact arm and its extension pivoted on an elastic hinge. With this indicator, it is possible to obtain repetitive readings in all directions of movement. It is being used in strain gages as a center pickup, in jig bores and other machine tools as an indicator for measuring instruments, and for measuring the thermal expansion characteristics of materials.

The newly improved Balljet adjustable spindle kit will be shown by Sheffield. Four different gaging spindles for any size between 1 and 3 inches can be assembled and used at one time from the kit that consists of 8 tapercores, four sets of gaging anvils, a size setting fixture, a calibrator and four handles and hoses. This kit gives the advantages of air gaging but without a large investment in fixed size gaging heads and master rings. In case of loss of or damage to a production spindle, a gage can be made up from this kit to serve until a replacement can be obtained.

The Johnson Gage Co. will exhibit a line of ring-snap thread gages. Segments of this gage are actuated by the piece being gaged. The segments are self-opening in sizes #0 through 1 inch. The tension plunger causes segments to be self-positioning in sizes larger than 1 inch. The segments' peripheral and full form contact are the technical equivalent of a Go ring gage. The unit checks the cumulative size made up of

Taft-Peirce height gage.

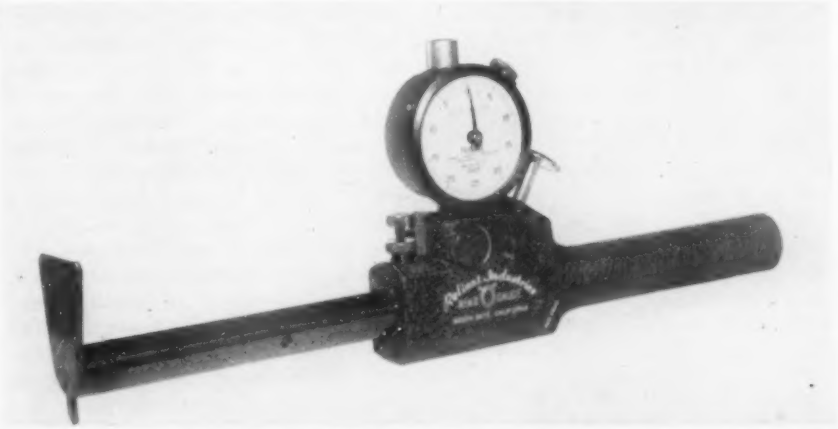
maximum pitch diameter, lead, angle, staggered helix, fat and bruised starting threads. Segments and rolls can be assembled and removed without disassembling the frame or removing studs. Mounting parts are rugged and interchangeable.

The Webber Gage Co. will exhibit a new gage block called Croblox. Made from chrome-carbide, these blocks have several outstanding properties. Their coefficient of expansion is similar to steel and they are ten times more resistant to corrosion and tarnishing than 18-8 stainless steel. Since this is a solid material, plating problems are avoided in the manufacture of these blocks. They are less costly than tungsten-carbide gage blocks and can be obtained as complete sets or as individual blocks for replacement of worn or damaged steel, chrome or tungsten-carbide blocks.

The Rahn Granite Surface Plate Co. will demonstrate a surface plate calibration instrument. Equipment consists of a Rahn black granite straight edge 36 in. long, a pair of 2-inch black granite parallels and a 0.00005-inch indicator mounted on a special base. The straight edge and parallels have been calibated by the National Bureau of Standards.

The parallels are placed on one diagonal of the surface to be checked. The straight edge is placed on the parallels and the indicator is moved on the surface under the straight edge. Readings are taken at as many places as desired and corrected to the Bureau of Standards calibration. The same process is repeated on the other diagonal. Since two intersecting straight lines determine a plane, these two sets of readings indicate the major variation from a plane. Additional measurements can be taken if desired.

The Bryant Chucking Grinder Co. will be exhibiting a new series of granite surface plates at the show. Made of Vermont Rock of Ages granite these surface plates have a close-knit composition. This granite ranks in the middle of the granite hardness range and can be cut and finished easily. The Bryant plates have the working surface on the head of the grain. These plates range in size from 12 by 18 to 36 by 48 and in weight from 78 to 1240 lb. Overall accuracies are 0.0001 inch for the



Reliant dial indicator O-ring groove gage.

Blue-white granite surface plate.

smaller sizes and 0.0002 inch for the larger sizes. They are from four to eight inches thick.

The Taft-Peirce Manufacturing Co. will exhibit a new surface plate at the show. A blue-white granite plate made of even-grained granite from Westerly, Rhode Island. The angle of grain of these plates to the working surface is approximately 45 deg. As with all granites, if a heavy or pointed object drops on one of these plates, the stone is somewhat powdered at the point of contact but there is no compensating disturbance of the surrounding surface. Ordinary temperature variations have no effect on this surface plate. Because of its low moisture absorption, work or tools left on the surface plate are not subject to rust.

Surface accuracy of 4-ledge plates is 0.00005 inch per foot; accuracy of 2-ledge plates is held to 0.00001 inch per foot. Plates are made with working areas ranging from 9 by 12 to 36 by 72 inches. Special plates can be obtained with a working surface of 48 by 95 inches. Thickness ranges from 4 to 14 inches and weight from 40 to 6176 pounds.

Hydraulics and Pneumatics

Based on the floating spool principle, the new Speed King air and low pressure solenoid pilot-operated control valve has a life expectancy of over 20,000,000 cycles. To be shown by Valvair, Corp., speed of operation of this valve can be up to 600 cycles per minute on air service. The valve is available in 3-way, 4-way and 4-way 5-port models with the same 3-way pilot mounted on each.

The Mead Specialties Co. will introduce a new line of midget air cylinders. These cylinders have a bore of 1 inch and lengths of stroke of 1, 2 or 3 inches. The return motion is by internal spring and the cylinders can be furnished for vertical or base mounting.

The Skinner Electric Valve Div., The Skinner Chuck Co., will exhibit a new small size V9 four-way solenoid valve. Designed for the automatic control of single and double-acting air and hydraulic cylinders, the valve is direct acting, uses no packing for sliding seals and is spring loaded for positive operation in any position. These valves are for use on pressures between 50 and 150 psi and have orifices from $\frac{3}{64}$ to $\frac{1}{8}$ inch. Three basic types are available; normally-open, normally-closed and normally-open or normally-closed.

A new heavy-duty line of air cylinders will be shown by The S-P Manufacturing Co. These cylinders are for use in automating processes and for general use on dies, machine tools, presses and welding machinery. They are available in five types of mountings and in eight bore sizes for $1\frac{1}{2}$ through 6 inches. These cylinders operate at pressures up to 200 psi and have an unusual cartridge type rod packing and bearing, which makes possible the change of packings in minimum time.

The new Beckett-Harcum Co. Hi-Cyclic solenoid valves feature an industrial solenoid with a continuous service rating, and special shock resisting devices to ensure long life and dependability. All valve parts are of corrosion resistant materials and the stainless steel spool is dampened to prevent actuation by machine vibrations. These single and double solenoid valves can be used with any fluid working medium and are available in three sizes.

A new gasket-mounted solenoid operated 4-way valve that is fully shock resistant will be shown by Rivett Lathe & Grinder, Inc. Impact and shock are avoided by the use of a spool of scalloped design. Metering grooves built into the spool plus a choke block assembly to control the speed of the spool aid in maintaining smooth flow. The Series 6600 valves are for use on 3000-psi oil hydraulic service and feature low pressure drop and low back pressure.

Chemicals and Fluids

The F. E. Anderson Oil Co. will exhibit additions to several of their lines. Lusol K-5 is a newly developed clear, transparent, nonfoaming chemical grinding solution designed for use on all ferrous metals. It is especially useful in cast iron and titanium grinding. Winsor water conditioner TR-10 is a liquid for use in water based cutting fluids to soften the water and inhibit rust formation. Winsor PV-71 and PV-73 are new air-drying synthetic paints with good resistance to chemicals and chemical coolants. They can be used for touch-up and repainting of machine tools, or for new machines. Now available in grey and green colors.

A new Lo-Jet Acro mist cooling unit will be shown by Air Conversion Research Corp. This new unit offers precise and constant spray regulation and it can achieve the finest fog or an actual stream of coolant simultaneously to meet the needs of different operations serviced by the same unit.

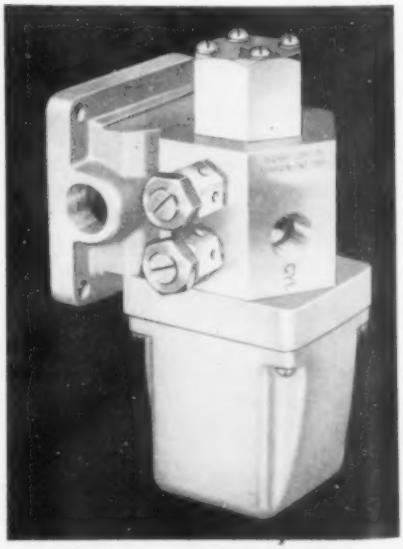
Master Chemical Corp. will be showing Trim, a coolant developed to meet the needs of modern machine tools. This chemical conducts heat faster than soluble oils and efficiently cools both the tool and the work. The material thoroughly wets metallic surfaces.

Electrically controlled and operated the new Kleer-Stream automatic oil recovery unit will be shown by the Pioneer Pump Div., Detroit Harvester Co. This unit recovers oil that can be used again, and reduces stream pollution. This equipment can be used with parts washers, coolant sumps and reservoirs handling liquids that contain oil.

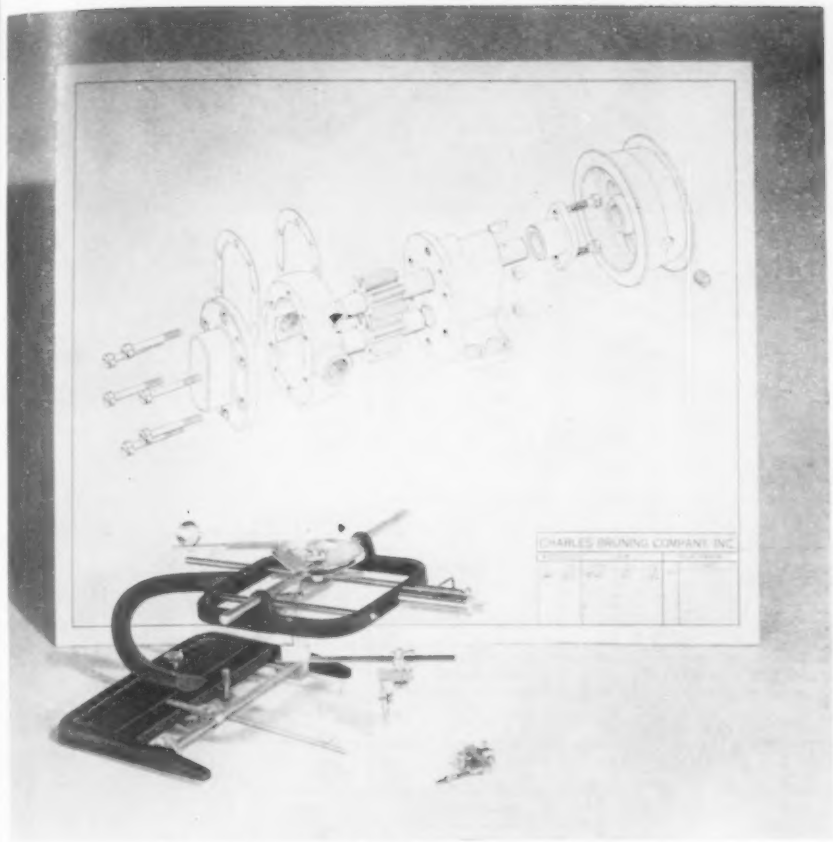
Drafting Room Equipment

A new item on display at the Mayline Co. booth will be the metal 5-drawer plan file. Furniture quality steel is used in the construction of these files and they are finished with hammer gray enamel. Drawers operate on ball bearings. The 5-drawer unit is designed so that several can be stacked. The bottom unit is mounted on a flush or sanitary base and a cap is placed over the top unit. Each drawer contains a hinged dust cover to protect the plans, and the cover can be raised out of the way on tilting arms.

A new completely universal compass that determines and draws precise ellipses, spirals, helixes and arcs mechanically will be shown by the Charles Bruning Co. A simple setting to establish the major diameter, and another to establish the minor diameter enable the user to draw perfect ellipses in any



Hi-Cyclic solenoid valve.



Universal compass for preparing pictorial views.

ratio by degrees or from points on a drawing. Repeated ellipses on the same axis are easily made because of this machine's rolling parallel action. The instrument is especially useful for exploded views.

Bruning is also going to display a five-piece set of templates that provide a uniform, positive system of determining dimensions of lines and angles in any direction without involved calculations or projections. Even curves, radii and ellipses can be determined through use of the templates. These templates permit the preparation of pictorial views from any angle.

Miscellaneous Equipment

The Heli-Coil Corp. will exhibit a new thread repair kit, No. 34CS, that has been specifically designed for maintenance departments of manufacturing firms. These kits contain an assortment of 25 formed wire thread inserts in each of four commonly used sizes. All tools necessary for wire insert thread repairing are included; a tap and inserting tool for each size and an insert extractor. When an internal thread has been damaged, the hole should be retapped and an insert applied. When correctly done, the original bolt (if undamaged) can be used in the insert.

The Micro Switch Div., Minneapolis-Honeywell Regulator Co., will exhibit an electric two-hand clutch control for installation on existing industrial machinery. Installation on manually operated power machines will result in a gain in production and increased safety. Both switches must be pressed at the same time. If one is pressed prematurely, a reset button must be pressed before the clutch can be operated again.

Wohlnip drill extractors will be shown by the R. B. Tool Co. Each extractor consists of a pair of wires, a center guide, housing and a collar. The wires are twisted around the broken

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twist drill as far as possible. The other parts are assembled and the drill can be removed. Since the wires are completely surrounded, they cannot deform. A set consists of 6 sizes of extractors that will cover drills from $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter.

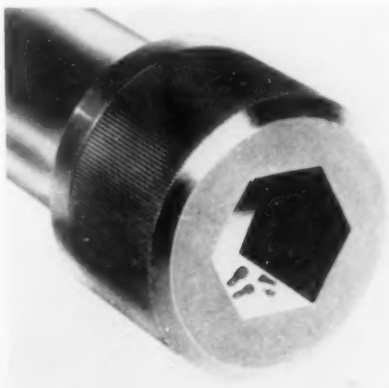
Three lines of precision bolts will be shown by Standard Pressed Steel Co. These lines are a big socket-head bolt in sizes up to three inches in diameter, double-life cold worked Military Standard bolts and a series of light weight titanium bolts. The big bolts are standardized in lengths up to 12 inches but can be specially produced in lengths up to 36 inches.

Fawick Airflex Div., Federal Fawick Corp. will exhibit the new VC AirRing clutch. This completely ventilated unit of the rigid type provides for transmission of power from the friction shoes through torque bars to the metal side plates of the assembly. This clutch is manufactured in sizes from $11\frac{1}{2}$ through 42-inch drum diameters with torque capacities of 27,000 to 380,000 inch-pounds.

The Webber Manufacturing Co. will show the Model W-12-125F industrial freezer that is designed to operate at temperatures as low as -125 F and is used in the treatment of metal for stabilizing, hardening and shrink fitting. Also shown, will be an environmental test chamber designed for testing materials at temperatures as low as -200F or as high as 300 F. Humidity and vacuum equipment are optional with the test chamber.

A complete line of immersion type coolant pumps will be shown by Graymills Corp. The pumps are available in centrifugal designs that can be used when abrasives are present and in gear types where higher pressures are required. Motors are mounted in line with the impellers and they supply sufficient power to clear the chips from a horizontally drilled hole when heavy cutting oils are used.

This section has not been all-inclusive for several reasons. Information from some exhibitors was not received in time for inclusion and many exhibitors had not completed their plans for showing new equipment by presstime. Many new products have been included in this special section, but to realize the best introduction to these, and to those that could not be covered here, a trip to Philadelphia between the 26th and 30th of April would be in order. More information on the products in the section can be obtained by using the Special Reader Service Card on Page 201.

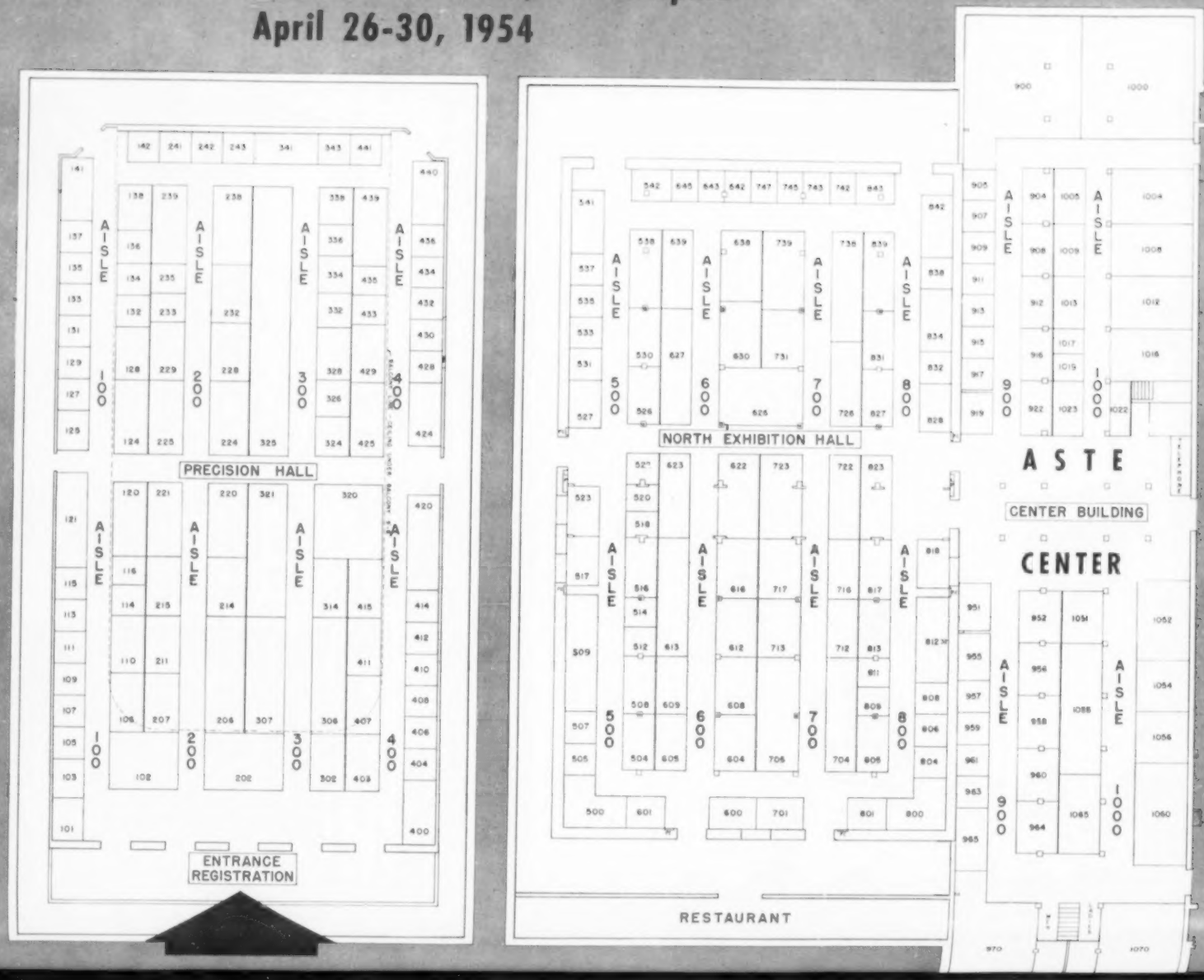


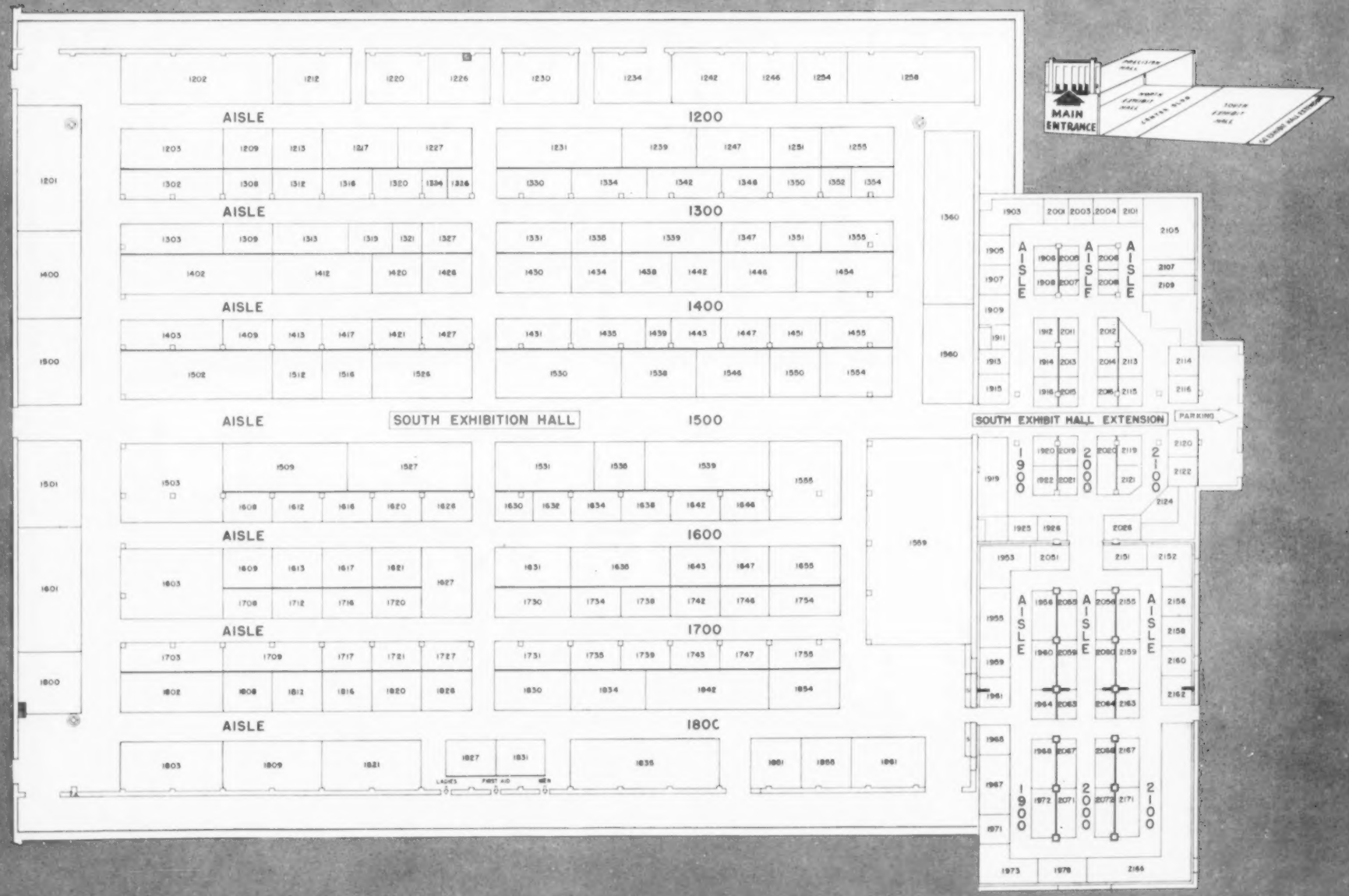
Unbrako size extremes.

Floor Plan ASTE Industrial Exposition

Convention Center, Philadelphia

April 26-30, 1954




MAIN ENTRANCE
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SOUTH EXHIBIT HALL EXTENSION
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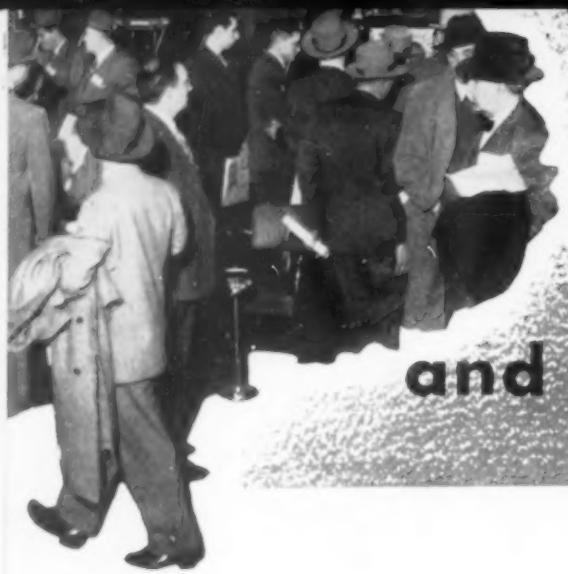

EXHIBITORS and products displayed

Booth No.

Accurate Bushing Co. 141
443 North Ave. Garwood, N. J.
Drill jig bushings; piercing punches; pump type jigs; industrial precision parts.

Ace Drill Bushing Co., Inc. 917
5407 Fountain Ave. Los Angeles 29, Calif.
Drill bushings; master locater jigs; lock screws and clamps.

Ace Drill Corp. 125
Adrian, Mich.
Drills; reamers; drill blanks; punches; knock-out and insert pins; carbide tools.

Acme Steel Products Div., Acme Steel Co. 904
2840 Archer Ave. Chicago 8, Ill.
Metal stitchers; box stitchers; strapping tools.

Acme Tool Co. 1022
71 W. Broadway New York 7, N. Y.
Universal toolholders; surface, angle, lapping, master angle plates; parallels; straight edges; toolmakers knees; V-blocks; portable tools.

Adamas Carbide Corp. 951
Kenilworth, N. J.
Carbide tools; dies; wear parts; special shapes.

Air Conversion Research Corp. 1251
4107 N. Damen Ave. Chicago 18, Ill.
Lubricators; filters; pressure regulators; metal cutting coolant systems; accessories.

Alemite Div., Stewart-Warner Corp. 1319
1826 Diversey Parkway Chicago 18, Ill.
Oil mist, centralized lubricator systems.

Alexander, Geo. H., Machinery Ltd. 905
Birmingham, Eng.

Booth No.

Allegheny Ludlum Steel Corp. 224
Brackenridge, Pa.
Tool steels; carbides; forging and casting products.

Allen Tool Co., Div. Allen Industries, Inc. 1005
Springfield, Ohio
Tools; jigs; fixtures; reinforced plastic tooling.

Allied Products Corp., Richards Brothers Punch Div. 1227
1560 E. Milwaukee Ave. Detroit 11, Mich.

Allison Co., The 1331
257 Island Brook Ave. Bridgeport 8, Conn.
Abrasive cutoff wheels

Aloris Tool Co., Inc. 1916
131-37 Sanford Ave. Flushing 55, N. Y.
Toolholders; lathe accessories.

Alpha Tool Works 1755
9281 Freeland Ave. Detroit 28, Mich.
Tryout and cutoff presses; die feeds.

American Chain & Cable Co., Inc. 1802
Bridgeport 2, Conn.
See Campbell Machine Div.

American Coldset Corp. 105
87 Court St. Paterson, N. J.
Diamond dressing, boring and drill tools; bits; diamond wheels; industrial diamonds.

American Cystoscope Makers, Inc. 106
1241 Lafayette Ave. New York 59, N. Y.
Industrial telescopes for inspection of relatively inaccessible surfaces.

American Drill Bushing Co. 1234
5107 Pacific Blvd. Los Angeles 58, Calif.
Drill jig bushings.

Booth No.

American Fabricating Co. 2007
Box 66, Linwood Sta. Detroit 6, Mich.
See The Pneuma-Draulic Co., (Div. of)

American Gage & Machine Co. 332
2500 W. Washington St. Chicago 12, Ill.
See Size Control Co. (Div. of)

American Machine & Foundry Co. 834
511 Fifth Ave. New York 17, N. Y. and
See Float Dock Div. and Wahlstrom Div. 838

American Milling Machine Inc. 1908
3136 E. Olympic Blvd. Los Angeles 23, Calif.
Vertical milling machine.

American Pullmax Co., Inc. 1703
2455 N. Sheffield Ave. Chicago 14, Ill.
Sheet steel and plate cutting machines for cutting, beading, joggling, dishing, and slotting.

American Sip Corp. 1546
100 E. 42nd St. New York 17, N. Y.
High precision jig boring; drilling and milling machines; optical measuring machines; precision instruments; profile projectors; dividing machines; tilt-table tables.

American Society of Tool Engineers Center Bldg.
10700 Puritan Ave. Detroit 38, Mich.
Society membership; education; research and industry services; THE TOOL ENGINEER magazine; ASTE Die Design Handbook; Tool Engineers Handbook; Annual Papers; Data Sheets; and other publications.

American Tooling Corp. 909
60 East 42nd St. New York 17, N. Y.
Carbide replacement tips; cutting tools; tool bits; blanks; hydraulic vises; drill grinding machines.

American Wheelabrator & Equipment Corp. 1209
451 S. Byrkit St. Mishawaka, Ind.
Wet blast machines for close tolerance finishing; airless abrasive blast cleaning and finishing.

Ames, B. C., Co. 338
131 Lexington Ave. Waltham 54, Mass.
Micrometer dial indicators and gages.

Ampco Metal, Inc. 1730
1745 S. 38th St. Milwaukee 46, Wis.
Metalwear strips; bushings; centrifugal and sand castings.

Amplex Div., Chrysler Corp. 1827
6501 Harper Ave. Detroit 31, Mich.
Self-lubricating bearings and machine parts; metal filters.

Booth No.

Anderson, F. E., Oil Co., Inc. 1516
Portland, Conn.
Cutting oils; lubricating oils; machine cleaner; rust preventatives; machine tool paints; lacquers; defoamers.

Anderson & Sons, Inc. 609
N. Elm and Notre Dame Westfield, Mass.
Photo identification badge with snap-on clip; decorated metal products; instrument dials; panels; nameplates and novelty items.

Annis, R. B., Co. ,742
1101 N. Delaware St. Indianapolis 2, Ind.
Balancing machines; demagnetizers; electric etchers.

Armor-Tuf Sales Corp. 2163
299 Madison Ave. New York, N. Y.

Armstrong Bros. Tool Co. 232
5200 W. Armstrong Chicago 30, Ill.
Toolholders; cutters; bits and blades; lathe dogs; C clamps; setup and hold down tools; wrenches; pipe tools.

Aro Equipment Corp., The 1608
Enterprise and Trevitt Sts. Bryan, Ohio
Portable pneumatic power tools; industrial lubrication equipment.

Arrow-Hart & Hegeman Electric Co., The 1959
103 Hawthorn St. Hartford 6, Conn.
Industrial motor controls.

Arrow Tool & Reamer Co. 1956
422 Livernois Detroit 9, Mich.
Carbide-tipped and high-speed steel tools; live centers; counterbores; countersinks; drills; end mills; reamers.

Associated American Trading Co. 1831
Empire State Building, 350 Fifth Ave.
New York 1, N. Y.
Automatic coil winding machines; wire take-offs; tensioning devices; profile boring head; jig mills, jig borers and die-sinking machines; tools; attachments and accessories.

Associated Machine Tool Corp. 2167
535 McNeily Rd. Pittsburgh 26, Pa.
Radials; gear shapers; automatic cold saws.

Austenal Laboratories, Inc. 110
224 E. 39th St. New York 16, N. Y.
See Microcast Div.

Austin Industrial Corp. 1334
P. O. Box 430 White Plains, N. Y.
Milling machines; shapers; hydraulic hacksaws.

Automatic Methods Inc. 1909
965 W. Grand St. Elizabeth 2, N. J.
Lead screw tapping attachments.

EXHIBITORS

Booth No.

Bachmann, Eric R., Co. 1055
27-11 41st Ave. Long Island City 1, N. Y.
Automatic screw machines; precision gear hobbing machines; centerless grinders; lathes; tool and cutter grinders; optical profile grinders; milling machines; shaping machines; precision ground hobs.

Barnes, W. O., Co., Inc. 1354
1297 Terminal Ave. Detroit 14, Mich.
Metal cutting hack and band saw blades; 100 foot band saw box.

Barnes Drill Co. 907
814 Chestnut St. Rockford, Ill.
Magnetic coolant separators; coolant filters; combination fabric coolant filter and chip honing tools; honing abrasive stones.

Barry Corp., The 2171
700 Pleasant St. Watertown, Mass.
Machine mountings that give mobility to machine tools, isolating shock and vibration.

Basco Mfg. Co., The 2115
3 Woodside St. Stamford, Conn.
Magnetic separators for sheet steel.

Bausch & Lomb Optical Co. 302
626 St. Paul St. Rochester 2, N. Y.
Contour measuring instruments; bench comparators; toolmaker and shop microscopes; industrial stereomicroscopes; wide field tubes.

Bay State Abrasive Products Co. 1631
15 Union St. Westboro, Mass.
Grinding wheels and other abrasive products.

Beaver Tool & Engineering Corp. 517
Box 429 R.R. 1 Royal Oak, Mich.
Quick-change holders and adaptors; milling cutters; drill reamers and tap drivers; milling machine taper arbors; adaptors and boring heads; engineer and design service.

Beckett-Harcum Co. 1054
1140 Wayne Rd. Wilmington, Ohio
Air and hydraulic valves; drilling and tapping machines; side arm feeds for drill presses; index tables.

Bentley Industrial Corp. 1016
41 E. 42nd St. New York, N. Y.
Machine tools; accessories; engineering equipment; optical instruments.

Black Drill Co. 1727
1412 E. 222nd St. Cleveland 17, Ohio
Drills; automatic drilling units; air-operated vises.

Black & Webster, Inc. 642
445 Watertown St. Newton 58, Mass
Solenoid-operated production tools; electropunches; electrostakes; electropress; special high thrust solenoids; foot switches; time study devices.

Booth No.

Blake, Edward, Co. 1626
437 Cherry St. West Newton 65, Mass.
Drill, flute and tap chamfer grinders; cutter sharpener; surface finish standards.

Boggis, Henry P., & Co. 743
706 E. 163rd St. Cleveland 10, Ohio
Tap grinding machines and fixtures; taps; relief grinding fixtures.

Boice Mfg. Co. 341
Staatsburg, N. Y.
Gages; gage masters.

Bokum Tool Co. 242
14775 Wildemere Detroit 21, Mich.
Boring tools, HSS and carbide-tipped, solid carbide tools; toolholders; outside turning tools; screw machine accessories.

Boyar-Schultz Corp. 1809
2110 Walnut St. Chicago 12, Ill.
Surface and profile grinders; screw machine tools; copper head laps; T-slot bolts; grinding wheels.

Boyd Machine, Inc. 2154
711 E. Fourth St. Royal Oak, Mich.
Air and machine vises and speed changers for drill press.

Bradley Machinery Co., The 507
211 Jos. Campau Detroit 7, Mich.
Milling machine; tool box; thread roller.

Bramson Publishing Co. 811
P. O. Box 1 Birmingham, Mich.
Production Magazine.

Brehm Die Div., Steel Products Engineering Co. 622
1150 W. Main St. Springfield, Ohio

Bridgeport Machines, Inc. 1826
500 Lindley St. Bridgeport 6, Conn.
Milling machines; attachments and accessories.

Bristol Co., The, Socket Screw Div. 1964
Waterbury 20, Conn.
Multiple-spline and hex socket setscrews; socket cap screws; socket shoulder screws; socket pipe plugs; keys.

Brown & Sharpe Mfg. Co. 1402
235 Promenade St. Providence 1, R. I.
Machinists' tools and gages; electronic measuring equipment; Johansson gage blocks and accessories; milling cutters; arbors, adapters and collets; screw machine tools; miscellaneous shop equipment.

Brown Vertical Milling Head Co. 2162
1615 Riverside Dr. Los Angeles, Calif.
Vertical milling heads; bench milling machines.

Booth No.

Bruning, Charles, Co., Inc. 320
4700 Montrose Ave. Chicago 41, Ill.

Optical tooling instruments; circular drawing machine; technical illustration templates; desk-side copying machine.

Brush Electronics Co. 916
3405 Perkins Ave. Cleveland 14, Ohio

Surface roughness measuring instruments and motor drives; strain equipment.

Bryant Chucking Grinder Co. 220
Springfield, Vt.

Thread and groove gages; granite surface plates and stands.

Buck Tool Co. 1647
2015 Schippers Lane Kalamazoo, Mich.

Universal chucks; independent chucks.

Burg Tool Mfg., Inc. 1635
3743 Durango Ave. Los Angeles 34, Calif.

Turret drills; toolholders; tapping heads.

Cadillac Stamp Co. 500
17315 Ryan Rd. Detroit 12, Mich.

Hydraulic and hand marking machines; air impact press; marking devices.

Campbell Machine Div., American Chain & Cable Co., Inc. 1802
Bridgeport 2, Conn.

Cutoff machines; nibbling machines.

Carbide Processor's Supply Co. 2166
1304 Harper Ave. Detroit 11, Mich.

Carbide grinding machines; diamond wheel oil grinding fixtures; diamond wheel adapters.

Carbide Tool Co. 2166
1304 Harper Ave. Detroit 11, Mich.

Carbide single point and form tools.

Carboloy Dept. of General Electric Co. 1603
Box 237 Detroit 32, Mich.

Cemented carbides; permanent magnets; created-metals.

Carpenter Steel Co., The 102
Reading, Pa.

Tool and die steels.

Carter Controls, Inc. 512
2800 Bernice Rd. Lansing, Ill.

Air and hydraulic cylinders; boosters; air valves and feeds.

Cerro De Pasco Corp. 952
38 Wall St. New York 5, N. Y.

Low temperature melting bismuth alloys; applications.

Booth No.

Challenge Machinery Co., The 2119
Grand Haven, Mich.

Surface plates; universal box angles; universal angle irons; box parallels; V-blocks; straight edges.

Chemical Development Corp. 2107
Danvers, Mass.

Plastic-steel for tools; tool strip; strip for protection of polished metal sheets during fabrication; cement for bonding grinding segments.

Chicago Pneumatic Tool Co. 1330
6 E. 44th St. New York 17, N. Y.

Hydraulic riveting equipment; power screwdrivers; electric grinding tools.

Chicago Rivet & Machine Co. 1655
9600 W. Jackson Blvd. Bellwood, Ill.

Rivets; automatic riveters.

Chicago Tool & Engineering Co. 1915
8383 S. Chicago Ave. Chicago 17, Ill.

Vises; index tables; lathe milling attachment; welding accessories; woodworking router.

Chicago Tramrail Corp. 1735
4000 W. Washington Blvd. Chicago 24, Ill.

Overhead stacker crane.

Chilton Publishing Co. 839
100 E. 42nd St. New York 17, N. Y.

Automotive Industries; The Iron Age.

Chrysler Corp. 1827
6501 Harper Ave. Detroit 31, Mich.

See Amplex Div.

Cincinnati Milling Machine Co., The 1202
Marbury Ave. Cincinnati 9, Ohio

Surface heating and control equipment; flame hardening machines; gas control cabinets; power control cabinets; automatic brazing units; gas booster units.

Circular Tool Co., Inc. 228
763 Allens Ave. Providence 5, R. I.

Slitting saws, disks; slotting saws; cutoff saws; carbide saws; rotary shear blades; circular knives; combination countersinks; center reamers; high-speed steel; carbide.

Cities Service Petroleum, Inc. 436
60 Wall Tower New York 5, N. Y.

Instruments for continuous reading and direct measurement of oxygen and combustibles in samplings of furnace atmospheres; industrial and motor oils.

EXHIBITORS

Booth No.

Cleveland Cutter & Reamer Co., The 2072
Madison Ave. at 74th St. Cleveland 2, Ohio

Form relieved and profile cutters; form tools; cutoff tools; special end mills; special reamers; inserted tooth cutters and adjustable reamers.

Collins Microflat Co. 430
2326 E. 8th St. Los Angeles 21, Calif.

Black granite surface and layout plates; straight edges; parallels.

Colonial Broach Co. 1613
P. O. Box 37, Harper Station Detroit, Mich.

Broaching tools.

Columbia International Corp. 1903
10-35 44th Dr. Long Island City, N. Y.

Optical jigborer; universal cylindrical grinders; shaper; vertical milling machine; toolroom lathe; optical layout table.

Commander Mfg. Co. 823
4225 W. Kinzie St. Chicago 24, Ill.

Multiple drill heads; tappers; turret heads; drill units; drill chip breakers; coolant tables.

Conover Mast Publications, Inc. 716
205 E. 42nd St. New York 17, N. Y.

Mill & Factory and other publications.

Cosa Corp. 1559
Chrysler Bldg., 405 Lexington Ave. New York 17, N. Y.

Automatic screw machines; balancers; burnishers; coil winders; cold saws; copy millers; drilling and tapping machines; drill presses; radial drills; grinders; grinding spindles; automatic inspection machines; lathes; optical jig borers; comparators; millers; pinion cutting machines; signal gages.

Crafts, Arthur A., Co., Inc. 412
603 Newbury St. Boston, Mass.

Diamond and carbide tipped tools; gages; wear parts.

Craley, C. C., Mfg. Co. 514
P. O. Box 12 Shillington, Pa.

Offset boring heads.

Crucible Steel Co. of America 626
Henry W. Oliver Bldg. Pittsburgh 30, Pa.

Tool, high-speed, stainless, alloy, die and machinery steels; special purpose steel magnets and castings; stainless steel tubing; applications.

Crystal Lake Grinders 1427
375 Walkup Ave. Crystal Lake, Ill.

Precision cylindrical grinders; surface grinders.

Curta Calculator Co. 2056
3851 W. Madison St. Chicago 24, Ill.

Calculators.

Booth No.

Cushman Chuck Co., The 1302
806 Windsor St. Hartford 2, Conn.

Air operated chucks; cylinders and accessory equipment; power wrenches; chucks and face plate jaws.

Dake Engine Co. 1616
647 Monroe St. Grand Haven, Mich.

Arbor and hydraulic presses.

Danly Machine Specialties, Inc. 1601
4538 W. Roosevelt Rd. Chicago, Ill.

Die sets and die makers' supplies.

Davey Compressor Co. 1973
600 Franklin Ave. Kent, Ohio

Rotary air compressors.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co. 1500
Fond du Lac, Wis.

Tool holders; extension boring heads; block cutters; car wheel boring tools; fly cutters; stub and line boring bars.

Davis, A. G., Gage & Engineering Co. 439
21435 Dequindre Hazel Park, Mich.

Gage units for special gage design; indicator depth gages; flush-pin gage blanks; groove diameter gages; hydraulic gages.

Dazor Mfg. Corp. 955
4481 Duncan Ave. St. Louis 10, Mo.

Industrial incandescent and fluorescent lighting fixtures; magnifiers with fluorescent lighting.

Deakin, J. Arthur, & Son 905
150-28 Hillside Ave. Jamaica 2, N. Y.

Diesinking and engraving machines; bench cutter grinders; nut tapper; optical dividing head; swivel vises; etching pencils and transformers; centering microscopes; cutter grinder microscopes.

Dearborn Gage Co. 133
22038 Beech St. Dearborn, Mich.

Gage blocks; accessories; internal setting gages; sine bars; flat triangle and sine bar sets; plug gages; taperlocks; ring gages.

Delpark Corp., Industrial Filtration Co. 1009
P. O. Box 271 Lebanon, Ind.

Industrial filters.

Delta Power Tool Div., Rockwell Mfg. Co. 1842
400 N. Lexington Ave. Pittsburgh 8, Pa.

Drill units and presses; shapers; disk and belt finishing machines; belt finishing and deburring machine; cutoff machine; tool grinders band saws; accessories.

Booth No.

Denison Engineering Co., The 1400
1153 Dublin Rd. Columbus 16, Ohio

Hydraulic pumps; motors; controls; hydraulic equipment.

de Sanno, A. P., & Son, Inc. 1065
Phoenixville, Pa.

Abrasive cut-off machine with hydraulically driven head; grinding wheels.

Detroit Harvester Co. 1335
14300 Tireman Detroit 28, Mich.

See Pioneer Pump Div.

Detroit Milling Cutter Co. 1220
28625 Grand River Ave. Farmington, Mich.

Carbide indexable milling cutters; loadmeters.

Detroit Power Screwdriver Co. 1451
2801 W. Fort St. Detroit 16, Mich.

Screwdriving machines; selective barrel and bowl feeding devices.

Detroit Reamer & Tool Co. 504
2830 E. Seven Mile Rd. Detroit 34, Mich.

Special cutting tools, including reamers and drills; grinding attachments; toolholder.

Detroit Stamping Co. 440
350 Midland Ave. Detroit 3, Mich.

Toggle clamps; milling machine arbor spacers; steel and brass shim stock; feeler gage steel; die-formed steel; blower housings; stampings.

De Walt, Inc. 834 and 838
Lancaster, Pa.

Woodworking machinery.

Dewitt Equipment Co. 1906
136 Lafayette St. New York, N. Y.

Lathe chucks; power chucks; precision tools and gages; machine shop equipment and accessories.

Die Supply Co., The 1312
1400 Brookpark Rd. Cleveland 9, Ohio

Die sets; die parts and accessories; jig and fixture components; layout fluid; copper alloys; hitch and die feeds; guide pin oilers; bolster plates.

Dietzgen, Engene, Co., Inc. 1426
218 E. 23rd St. New York 10, N. Y.

Optical comparators; drafting room equipment and supplies; engineering services; furniture and fixtures; reproduction machines and equipment; surveying instruments and accessories.

DoAll Co., The 1503
254 N. Laurel Ave. Des Plaines, Ill.

Band machines; cutoff machines; grinders; cutting tools; saw bands; gages; gaging equipment; surface plates; tool steels; industrial supplies.

Booth No.

Doerr Electric Corp. 1955
Cedarburg, Wis.

Special electric motors; multispeed, rapid reversing motors; variable speed drives; special mountings.

Donovan Co. 922
1615 N. 2nd St. Philadelphia 22, Pa.

Heat treating services and equipment; heat treating furnaces; hardness testers and testing machines.

Douglas Tool Co. and Douglas Engineering Co. 956
3437 Goldner Detroit, Mich.

Differential drill unit; hi-helix contour milling cutter.

Dow Mechanical Corp., The 142
Thompsonville, Conn.

Gages; tacomps and accessories; bits; utility hole honer.

Drillunit, Inc. 963
3267 Wight St. Detroit 7, Mich.

Drillunits (nominally components of large index and transfer machines).

duMont Corp., The 235
Greenfield, Mass.

Keyway broaches and sets; special broaches; high-speed ground tool bits (square and rectangular); special tool bits; arbor presses; magnetic gage bases.

Dumore Co., The 739
1300 Seventeenth St. Racine, Wis.

Automatic drill heads and units; tool post grinders; flexible shaft tools; hand grinders; quills (spindles); drill grinder; light drilling equipment; automatic tapping unit.

Dynatomic Corp. 2021
1808 E. Creighton Ft. Wayne, Ind.

Carbide grinders, one with automatic profile grinding unit.

East Shore Machine Products Co., The 1019
835 E. 140th St. Cleveland 10, Ohio

Adjustable expansion keyway push broaches; tapered gear pumps.

Eastern Machine Screw Corp., The 1642
Truman & Barclay Sts. New Haven, Conn.

General purpose and insert chaser die heads; chaser grinding fixtures; floating toolholders; aligning indicators.

Eastman Kodak Co. 307
343 State St. Rochester 4, N. Y.

Contour projectors for toolroom and production; demonstrations of optical gaging; gear checkers.

Eclipse Counterbore Co. 239
1600 Bonner Ave. Detroit 20, Mich.

Counterbores; coutersinks; two-piece core drills; back spotfacers; multi-diameter cutters.

EXHIBITORS

Booth No.

Elastic Stop Nut Corp. of America 206
2330 Vauxhall Rd. Union, N. J.
Self-locking fasteners; elastic stop nuts; roll-pins; applications.

Electro-Arc Mfg. Co. 1434
P. O. Box 448 Ann Arbor, Mich.
Electro-arc metal disintegrators.

Elgin National Watch Co., Abrasive Div. 415
Elgin, Ill.
Diamond abrasives; rotary tools (Carbide and high-speed steel burs); Golden circle; spring material.

Elox Corp. of Michigan 1342
740 N. Rochester Rd. Clawson, Mich.
Electrical discharge machines.

Emhart Mfg. Co. 1056
Hartford 1, Conn. and
See V & O Press, and also Henry Wright Div. 1060

Enco Mfg. Co. 527
4520 W. Fullerton Ave. Chicago 39, Ill.
Lathe turrets; magnetic base tools including magnetic base indicator holders, magnetic base lighting units and magnetic base magnifiers.

Engis Equipment Co. 124
431 S. Dearborn Chicago 5, Ill.
Cylindrical squares; tool scales and projection units; diamond compounds; optical and electronic inspection equipment; automatic circular dividing machine; drill point measuring instrument.

Ercona Corp. 131
527 Fifth Ave. New York 17, N. Y.
Indicating micrometers; passameters; orthotests; gage blocks; optical tooling equipment; surface finish testers; surveying instruments; magnifiers.

Erickson Tool Co. 805
2309 Hamilton Ave. Cleveland 14, Ohio
Collet chucks; tap chucks; tap holders; air-type collet chucks and air cylinders; automatic indexers; boring bars; expanding mandrels; related holding tools.

Errington Mechanical Lab., Inc. 645
24 Norwood Ave. Staten Island 4, N. Y.
Machine tool attachments.

Ettco Tool Co., Inc. 1612
594 Johnson Ave. Brooklyn 37, N. Y.
Drill and tap chucks; tapping attachments; electric indexing fixtures; drilling and tapping equipment.

Everede Tool Co. 915
2000 N. Parkside Chicago 39, Ill.
Machine tool accessories; cutting tools.

Ex-Cell-O Corp. 1526
1200 Oakman Blvd. Detroit 32, Mich.
Aircraft parts; broaches; bushings; carbide tipped tools; core drills; counterbores; face mills; form tools; grinding spindles; jet engine parts; milling cutters; spot facers; special tools.

Booth No.

Falcon Tool Co. 441
P.O. Box 4605 Detroit 34, Mich.
High-speed and carbide tipped tools including: end mills, reamers, form relieved cutters, taper interchangeable drive, counterbores with pilots and holders, milling cutters, special tools, wear strips and investment castings.

Fawick Airflex Div., Federal Fawick Corp. 1356
9919 Clinton Rd. Cleveland, Ohio
Air-operated clutches and brakes; rotorseals and quick-release valves.

Federal Products Corp. 321
1144 Eddy St. Providence 5, R. I.
Machine control gages; air-electric switches; air-probes; crankshaft gages; O-ring gages; gear gage; shallow diameter gages; other indicating gages.

Federal Tool & Mfg. Co. 2014
3600 Alabama Ave., St. Louis Park
Minneapolis 16, Minn.
Stampings, short run process.

Fenway Machine Sales Co., Inc. 2013
263 N. 23rd Philadelphia 3, Pa.
Portable nibblers; special adapters to convert to portable files or portable saws.

Ferguson Machine & Tool Co. 505
471 Paul Ave. Ferguson 21, Mo.
Roller gear drive; index tables; roll feeds; indexing conveyors.

Fidelity Tool Supply 1742
309 Vine St. Camden 2, N. J.

Firth-Sterling Inc. 120
3113 Forbes St. Pittsburgh 30, Pa.
High-speed steels; tool and die steels; stainless specialties; high-temperature alloys; carbides; high temperature cermets; heavy metal.

Float-Lock Corp., Div. American Machine & Foundry Co. 834 and 838
511 Fifth Ave. New York 17, N. Y.
Safety drill press vises; band saw vises; automatic chucks; automatic tapping attachments.

Gaines-Collins Co. 1816
5474 Alhambra Ave. Los Angeles 32, Calif.
See Quijada Tool Div.

Gairing Tool Co., The 225
Box 478, Roosevelt Park Annex Detroit 32, Mich.
Spade core and deep hole drills; standard and special cutting tools and cutting toolholders.

Galland-Henning Mfg. Co. 817
2753 S. 31st St. Milwaukee 15, Wis.
Air and hydraulic operating cylinders; hydraulic valves; hand, foot and solenoid-operated valves; pilot-operated valves.

Gammons-Hoaglund Co., The 801
395 Main St. Manchester, Conn.
Helical reamers and end mills.

Booth No.

Gardner Publishing, Inc. 1638
431 Main St. Cincinnati 2, Ohio

General Aniline & Film Corp. 965
Johnson City, N. Y.
See Ozalid Div.

General Electric Co. 1603
P.O. Box 237 Detroit 32, Mich.
See Carboloy Dept.

General Roto Co. 2156
847 E. 60 St. Los Angeles 1, Calif.
Roto-head, lathe accessory.

Geneva Machine & Tool Corp. 243
402 Ellamae St. Tampa, Fla.
Drives, all types.

Giddings & Lewis Machine Tool Co. 1500
Fond du Lac, Wis.
See Davis Boring Tool Div.

Glenn, Edward R., Co. 919
2601 N. Broad St. Philadelphia 32, Pa.
Drill bushings; piercing punches; spacers; boring and facing heads; flat ground tool steel; straightedges; vises; radius tools; transfer screws.

Goddard & Goddard Co. 1309
12280 Burt Rd. Detroit 23, Mich.
Milling cutters; solid, high-speed steel, form and profile types; inserted blade cutters and boring tools.

Govro-Nelson Co., The 808
1931 Antoinette Detroit 8, Mich.
Automatic drilling and tapping units.

Graham Machine Tool Co. 1851
231 Centre St. New York 13, N. Y.
Jig borers; universal millers; turret type and ram type millers; lathes; tool and cutter grinders; surface grinders; shapers.

Grand Tool & Supply Co. 1913
176 Grand St. New York 13, N. Y.
Drill jig bushings; arbors and adapters; live centers; die heads; vises; angle and surface plates; measuring instruments.

Graymills Corp. 526
3705 N. Lincoln Chicago 13, Ill.
Coolant pumps; cold degreasing equipment.

Green Instrument Co., Inc. 2016
385 Putnam Ave. Cambridge, Mass.
Pantograph engravers; rotary tables; self-centering vises; claming fixtures and cutter grinders; special machinery for production engraving.

Booth No.

Griffith-Raguse & Co., Inc. 1820
3015 Fox St. Philadelphia 32, Pa.
Grinding wheels and coated abrasives; abrasive grain and powders; power tools; hack and band saws; wax lubricants and drawing compounds; cutting tools; sanding machines; dressing tools; rotary power brushes.

Griswold, F. T., Mfg. Co. 407
Lancaster Ave. Devon, Pa.
Optical dividing heads; cam rise gages; drill point-checks; optical levels, straightedges and scales; industrial telescopes, microscopes; monoscopes.

Grob Bros., Inc. 1051
Grafton, Wis.
Metal band saws; filing machines; open end band saws; high-speed friction saws; cutoff saws; butt-welders.

Grob, Ted, Co. 1643
Grafton, Wis.
Thread rolling machines; thread milling machines; milling machines.

Grobet File Co. of America, Inc. 434
421 Canal St. New York 13, N. Y.
Swiss precision files; rotary files; rasps; burs; countersinks; carbides.

Guthery Machine Tool Corp. 1630
130 W. 42nd St. New York 18, N. Y.
Automatic screw machines; swiss types hand screw machines; turret lathes; automatic chip separating machines.

H.E.B. Machine Tools, Inc. 509
475 Fifth Ave. New York 17, N. Y.
Copying lathes; carbide tool grinders; radial drills; portable magnetic flaw detectors; automatic lathe chucks; quick change drilling and tapping chucks.

H & H Research 1022
6303 Horatio Detroit, Mich.
Reciprocating action electric portable tools and accessories.

Halpern & Co., Inc., Wm. 2019
100 Stevens Ave. Mount Vernon, N. Y.
Coil cradles.

Hammond Machinery Builders, Inc. 1303
1600 Douglas Ave. Kalamazoo, Mich.
Tool grinders; chip breaker grinders; tool finishers; polishing and buffing lathes; abrasive belt grinders; dust collectors.

Handy & Harman 613
82 Fulton St. New York 38, N. Y.

Hanna Engineering Works 1417
1765 Elston Ave. Chicago 22, Ill.
High and low pressure cylinders; foot operated valves; unitite valves; pilot valves; master air valves; solenoid valves; flowset valves.

EXHIBITORS

Booth No.

Hannifin Corp. 827
1101 S. Kilbourn Ave. Chicago 24, Ill.

Air and hydraulic cylinders; control valves; filters; regulators; lubricators.

Hansen Mfg. Co. 1352
4031 W. 150th St. Cleveland 11, Ohio

One-way shut-off couplings; two-way shut-off couplings; straight-thru couplings; sandblast cleaners; industrial spray guns.

Hansford Mfg. Corp. 2064
1239 University Ave. Rochester 7, N. Y.

Die handler, time-saving device for taking apart heavy dies.

Hanson-Whitney Co. 414
169 Bartholomew Ave. Hartford 2, Conn.

Finished taps; thread gages; thread comparators; hobs; multiple thread milling cutters; precision screws; worms.

Haskins, R. G., Co. 639
2651 W. Harrison St. Chicago 12, Ill.

Rotary filing and polishing machines and accessories; electric screwdriving and nut setting equipment; flexible-shaft and direct-drive bottle-capping machines.

Hause Engineering 2001
809 S. Pleasant Montpelier, Ohio

Automatic drill units; drill tapper units.

Haynes Stellite Co. Div., Union Carbide and Carbon Corp. 738
30 E. 42nd St. New York 17, N. Y.

Metal-cutting tools; hard-facing rods; special castings and alloys resistant to heat, abrasion, corrosion and erosion; precision investment castings.

Heinrich Tools Inc. 1646
1536 Clark St. Racine, Wis.

Air vises, fixture locks; handnib shears; nibblers; punches; rod cutters; drill press vises.

Heintz Mfg. Co. 1435
Front St. & Olney Ave. Philadelphia 20, Pa.

Fabricated metal components; jet engine stainless steel components; metal stampings; household appliances and equipment; stainless steel kegs; cold formed products.

Heli-Coil Corp. 713
Danbury, Conn.

Wire screw thread inserts; tap gages and tools for installation of inserts.

Heller Bros. Co. 2121
Heller Dr. Newcomerstown, Ohio

Milled curved tooth files; rotary files; carbide burrs; chatterless countersinks; centerlaps; tools; rasps.

Booth No.

Henry & Wright, Div. Emhart Mfg. Co. 1060
Hartford 1, Conn.

Dieing machine with automatic feeds, scrap cutter, variable speed drive, motorized reel, load and pressure instruments; progressive die.

Hillyer Co. 2109
54 Lafayette St. New York, N. Y.

Automatic drilling machine.

Hitchcock Publishing Co. 913
Wheaton, Ill.

Machine and Tool Blue Book.

Hoffmann, Alfred, Needle Works, Inc. 2113
3710 Hudson Ave. Union City, N. J.

See Hudson Automatic Machine & Tool Co., Div.

Homestrand, Inc. 343
Larchmont, N. Y.

Vernier calipers; vernier height gages; dial indicators; sine bars; gage stands; dial indicator testers; tapping attachment; boring bar; automatic flutemilling machine; center-tapping machine.

Honan-Crane Co., subs of Houdaille-Hershey Corp. 1438
Lebanon, Ind.

Magnetic filter; tubular conveyor; T-clarifier; water-oil separator; cartridge purifier; bulk purifier; F-purifier; precoat unit.

Horton Chuck, Div. Horton & Son 2055
Windsor Locks, Conn.

Lathe chucks; chuck-holding devices; chuck jaws; chuck indexing fixtures.

Houghton, E. F., & Co. 1743
303 W. Lehigh Ave. Philadelphia 33, Pa.

All-purpose cutting base; rust preventatives; heat treating compounds for tool hardening; specialized lubricants.

Howe & Fant, Inc. 1967
521 Flaxhill Rd. S. Norwalk, Conn.

Turret drilling and tapping machines; attachments.

Hudson Automatic Machine & Tool Co., Div. of Alfred Hoffman Needle Works, Inc. 2113
3710 Hudson Ave. Union City, N. J.

Swiss type automatics; combination tool grinding and lapping machine; cam tracer; cam miller; precision bench millers.

Huebner Publications, Inc. 1965
1975 Lee Rd. Cleveland 18, Ohio

Tooling and Production.

Huron Machine Products, Inc. 2008
6252 Monroe Blvd. Dearborn, Mich.

Handles and blanks; ring-gage blanks and assemblies; master setting blanks; insulator grips; ball handles.

Booth No.

Hydraulic Power Div., The Hydraulic Press Mfg. Co. 1212
Mount Gilead, Ohio

Air and hydraulic cylinders; hydraulic and rotary pilot valves; hydraulic pumps; motors and power units; accessories.

Hydraulics Publishing Co., The 2160
1240 Ontario St. Cleveland 13, Ohio

Applied Hydraulics.

Ideal Industries, Inc. 531
Sycamore, Ill.

Live centers; hammers; etchers; abrasive wheels; demagnetizers; tachometers.

Index Machine Co. 1308
543 N. Mechanic St. Jackson, Mich.

High-speed vertical and horizontal milling machines, attachments and accessories; swivel dividing heads; rod and indicator sets.

Industrial Chrome Div. Ward Leonard Electric Co. 137
South St. Mount Vernon, N. Y.

Chrome-plating equipment and solutions.

Industrial Diamond Association of America, Inc. 1861
124 E. 40th St. New York 16, N. Y.

Diamond tools; powder and compounds; uncut industrial diamonds.

Industrial Filtration Co. 1009
Lebanon, Ind.

See Delpark Corp.

Industrial Press, The 530
140 Lafayette New York 13, N. Y.

Machinery.

Industrial Scientific Co. 135
34 W. 33rd St. New York 1, N. Y.

Measuring instruments; automatic gaging and measuring machines; controls; machinery.

Industrial Tectonics, Inc. 433
3686 Jackson Rd. Ann Arbor, Mich.

Precision balls of: carbide, sapphire, high-speed steel, titanium, zirconium, tantalum, aluminum, bronze, carbon, ceramics, powder metal, chrome alloy, steel, stainless steels, nylon, teflon, lucite; solid and hollow balls.

Ingersoll-Rand Co. 1835
11 Broadway New York 4, N. Y.

Air and electric portable power tools; air compressors; coolant pumps; air hoists.

Booth No.

Inspection Equipment Co. 241
1610 S. Woodward Ave. Birmingham, Mich.

Comparator charts and reproductions; staging fixtures.

International Research & Development Corp. 435
168 E. Hosack St. Columbus 7, Ohio

Instruments for analysis and correction of machine vibration.

Jacobs Mfg. Co., The 1560
West Hartford 10, Conn.

Collet chucks (key operated); spindle nose lathe collet chucks, handwheel operated; drill and tap chucks.

Janney Cylinder Co. 1313
State Rd. & Shelmire, Holmesburg
Philadelphia 36, Pa.

Centrifugally cast and finished machine products: pump liners, compressor liners, diesel engine cylinder liners, valve seat rings, shaft sleeves, bearing cages, jet aircraft engine parts and other cylindrical shapes.

Jarke Mfg. Co. 1812
5407 N. Broadway Chicago 40, Ill.

Materials handling equipment.

Jarvis, Chas. L., Co. 1502
Stack St. & Pease Ave. Middletown, Conn.

Tapping attachments; flexible shaft and machines; high-speed taps; rotary files; multiple spindle drilling and tapping heads; reamers; end mills; boring bits; knurls; internal grinding tools; boring tools.

Jefferson Corp. 843
13330 Foley Detroit 27, Mich.

See Swartz Tool Products Div.

Johansson, C. E., Gage Co., Div. of Swedish Gage Co. 132
10641 Haggerty Ave. Dearborn 1, Mich.

Inspection equipment for linear dimension; gage blocks; comparators; surface finish analyzers; air gages.

Johnson, Eric S., Co. 2156
440 W. 19th St. Costa Mesa, Calif.

Tapping attachments; tap chucks; tap holders.

Johnson Gage Co. 334
534 Cottage Grove Bloomfield, Conn.

Concentricity, hand, plug, snap, and thread gages; thread and taper comparators; inspection equipment and quality control charts, systems, instruments.

Johnson Mfg. Corp. 1017
Albion, Mich.

Horizontal metal-cutting band saws.

EXHIBITORS

Booth No.

Jones & Lamson Machine Co. 1509
160 Clinton St. Springfield, Vt.

Automatic stationary and revolving die heads (radial and tangent type); chaser sharpening machines; comparator screens and charts; ground thread chasers; optical comparators and measuring machines; threading die accessories.

Jones, A. A., & Shipman Ltd. 1001
Narborough Rd., S. Leicester, Eng.

Hydraulic surface grinders; tool and cutter grinders.

Jones, A. A., & Shipman of Canada Ltd. 1004
614 St. James St., W. Montreal, Que., Can.

Kalamazoo Tank & Silo Co. 1734
508 Harrison Kalamazoo, Mich.

Horizontal metal-cutting band saw machines; automatic stock feeding attachment.

Kaufman Mfg. Co. 1634
Manitowoc, Wis.

Hydraulic drilling and tapping machine with indexing table; tapping machine with air-operated four division index.

Kearney & Trecker Corp., Walker-Turner Div. 1512
639 South Ave. Plainfield, N. J.

See Walker-Turner Div.

Kellerflex Diaform Sales, Div. of Pratt & Whitney Div., Niles-Bement-Pond Co. 1535
W. Hartford 1, Conn.

Wheel-forming attachments; pneumatic heads; flexible shaft machines; carbide and high-speed steel burs; hole-finishing burs; sanding and polishing equipment.

Kennametal, Inc. 1627
700 Lloyd Ave. Latrobe, Pa.

Carbide steel-mill rod guides; wood cutting blades; pulverizing hammer tips; saw tips; hot spinning tools; hooks and blades for cutting synthetic yarns.

Klingelhofer Machine Tool Co. 1258
740 Colfax Ave., W. Kenilworth, N. J.

Machine tools.

Korfund Co., Inc. 2026
48-15 Thirty-Second Pl. Long Island City 1, N. Y.

Vibration control mountings for machine tools.

Kurt Orban Co., Inc. 900
205 E. 42nd St. New York 17, N. Y.

Jig borer; universal vertical miller; drill grinder; turret lathe; gear tester; hob grinder; vertical mill and boring machine; shaper; grinder; relieving lathe.

Lamina Dies & Tools, Inc. 2051
14925 W. 11-Mile Rd. Berkley, Mich.

Guide pins and bushings.

Booth No.

Landis Machine Co. 1738
Waynesboro, Pa.

Thread cutting die heads; collapsible taps; thread rolling attachments.

Lapeer Mfg. Co. 1350
1144 W. Baltimore Detroit, Mich.

Toggle action clamps; pliers and wrenches.

Lassy Tool Co. 1922
Bohemia St. Plainville, Conn.

Hand tapping machines; universal tap and die guide; precision angle plates; work-holders.

Last Word Sales Co. 601
18500 Mt. Elliott Detroit 34, Mich.

Radius wheel dresser offset boring chuck; steady rest for OD grinding; floating holders.

Latrobe Steel Co. 1527
1944 Haller St. Latrobe, Pa.

Tool steels with integral lubrication by sulphide additives.

Lee, K. O., Co. 842
Aberdeen, S. D.

Tool and cutter, carbide, chip breaker, universal grinders; accessory fixtures; mandrels; chucks and other mill supply items.

Lees-Bradner Co., The 912
12120 Elmwood Ave. Cleveland 11, Ohio

Semiautomatic single-point threading machine.

Lehigh Foundries, Inc., Air Control Div. 1355
1500 Lehigh Dr. Easton, Pa.

Tracing tools for lathes; air cylinders; air valves; quick change toolholder.

Lempco Products, Inc. 1855
5490 Dunham Rd. Bedford, Ohio

Ball bearing die sets; automatic flute grinders; mobile cranes; reamers.

Lindberg Engineering Co. 1231
2450 W. Hubbard St. Chicago, Ill.

Air and hydraulic cylinders; induction heating unit; induction melting and holding furnaces.

Linde Air Products Co. 738
30 E. 42nd St. New York 17, N. Y.

Carbide flame plating equipment and processes.

Lipe-Rollway Corp. 726
806 Emerson Ave. Syracuse 1, N. Y.

Automatic magazine loading bar feed; portable power hacksaws.

Littell, F. J., Machine Co. 1239
4127 Ravenswood Chicago 13, Ill.

Reels; roll feeds; straightening machines; air blast valves; safety feeders.

Booth No.

Lodding, Inc. 537
79 Beacon St. Worcester 1, Mass.

Jig and fixture components; clamp assemblies; spring jacks; rest buttons; quarter turn screws; studs; hand knobs; handwheels; cams; spherical washers; fixture keys.

Logan Engineering Co. 908
Lawrence & Lamon Aves. Chicago 30, Ill.

Lathes and shapers.

Logansport Machine Co., Inc. 1550
40 Payson Rd. Logansport, Ind.

Air and hydraulic chucks; cylinders; valves; presses; steel tubes and fittings; centrifugal pumps; hydraulic power units.

Lovejoy Tool Co., Inc. 1421
2077 Safford St. Springfield, Vt.

Inserted tooth type milling cutters; face milling cutters; boring heads; special tools; flywheels for milling and boring machines; adaptors.

Lufkin Rule Co. 818
Hess Ave. Saginaw, Mich.

Precision tools; measuring tapes and rules.

Lynch, Edward A., Machinery Co. 1000
29 E. Wynnewood Rd. Wynnewood, Pa.

Presses and press brakes; shears; hydraulic bulldozers; bending rolls and steelworkers; combination punch and shears; welding fixtures; cold saws; saw-blade sharpeners; radial drill; milling machines.

McCaskey Register Div., Victor Adding Machine Co. 411
2500 S. Union Ave. Alliance, Ohio

Industrial control systems and forms: machine loading, scheduling, job assignment, dispatching and inventory; tool crib and gage control.

McCrosky Tool Corp. 1023
1938 Thomas St. Meadville, Pa.

Inserted-blade cutting tools: reamers; milling cutters; boring bars; special tools; machine tool attachments: quick-change chucks, turret tool posts.

McDonough Mfg. Co. 2005
P.O. Box 99 Eau Claire, Wis.

Bench drill grinder; universal tool and cutter grinder.

McGraw-Hill Publishing Co. 1420
330 W. 42nd St. New York 36, N. Y.

American Machinist and other metalworking magazines.

M-B Products 1439
46 Victor St. Detroit 3, Mich.

Airline filters; regulators; lubricators; portable pneumatic grinders; polishers.

Booth No.

M.B.I. Export & Import Ltd. 1821
475 Grand Concourse Bronx 51, N. Y.

Combination horizontal boring mill and jig borer with optical controls; lathes; surface grinders radial drills.

Mac-It Div. of Strong, Carlisle & Hammond Co. 410
1392 W. Third St. Cleveland 13, Ohio

Screw products; alloy steel fasteners.

Macklin Co. 1409
2914 Wildwood Jackson, Mich.

Grinding wheels and abrasive products.

Madison Mfg. Co., Madison Industries, Inc. 960
1713 7th St. Muskegon, Mich.

Boring bars; bottoming bars; boring cutters; bottoming cutters; grinding fixtures; deep hole drills; adjustable plug gages; trepanning tools.

Magna Engineering Corp. 1834
Menlo Park, Calif.

Universal drilling and tapping equipment; Shopsmith, multi-purpose woodworking tool.

Magnaflux Corp. 704
7300 W. Lawrence Ave. Chicago 31, Ill.

Nondestructive testing equipment and instruments.

Manco Mfg. Co. 2020
Bradley, Ill.

Portable hydraulic tools for cutting, punching and riveting.

Manhattan Rubber Div. Raybestos-Manhattan, Inc. 1953
Passaic, N. J.

Resinoid bonded cutoff wheels; New poly-V-power transmission belt; diamond wheels.

Manufacturers Associates 1008 and 1721
92 Liberty St. New York 6, N. Y.

Jig borer; copying milling and engraving machines; cutter grinder; universal honing head and adaptation; milling machines; feed table; grinding machines; broaching machines.

Marac Machinery Corp. 1201
1819 Broadway New York 23, N. Y.

Milling machines; cylindrical and external grinders; radial drills; boring and milling machines; die lapping machine for internal bores.

Martindale Electric Co. 747
P.O. Box 617, Edgewater Br. Cleveland 7, Ohio

Rotary files and burs; metalcutting saws; mica undercutting equipment; electrical and mechanical maintenance tools; metal-marking tools.

Master Chemical Corp. 1920
13 Huron St. Toledo 1, Ohio

Cutting and grinding fluid.

EXHIBITORS

Booth No.

Master Mfg. Co. 1454
Hutchinson, Kan.

Lathe converters; milling attachments; tool post grinders for lathes; milling and lathe heads; feed tables; combination milling, grinding and keyseating machine.

Matthews, Jas. H., & Co. 1978
3942 Forbes St. Pittsburgh 13, Pa.

General and special marking machines; steel stamps and dies for industrial marking.

Mattsson Machinery, Inc. 1070
19 Greenwood Ave. Montclair, N. J.

Milling machines; milling lathes; internal, surface and centerless grinders; tool and cutter grinder; turret lathes.

Mayline Co., Inc. 215
619 N. Commerce Sheboygan, Wis.

Drafting room equipment and supplies.

Mead Specialties Co., Inc. 1907
4114 N. Knox Ave. Chicago 41, Ill.

Pneumatic equipment.

Merrill Engineering Laboratories 138
1230 Lincoln St. Denver 3, Colo.

Job and short-run production precision industrial balancing machines; electronic industrial balancing machine.

Merz Engineering, Inc. 306
200 S. Harding St. Indianapolis, Ind.

Electronic gaging and sorting equipment.

Metal Carbides Corp. 425
107 E. Indianola Ave. Youngstown 7, Ohio

Carbide cutting tools; tips; toolholders; draw dies; centerless blades; lathe centers; gages; drill jig bushings; rolling mill work rolls; diamond wheels; diamond wheel dressers; heavy metal.

Metal Cutting Tools, Inc. 2124
Rockford, Ill.

High-speed steel and carbide-tipped end cutting tools: counterbores and countersinks, two-piece core drills, back spotfacing cutters and arbors, special multi-diameter cutters.

Metal Removal Co., The 1446
1546 N. Orleans St. Chicago 10, Ill.

Universal and centerless grinders and accessories; automatic hydraulic shaper; end mills; die sinking tools; portable grinders.

Metalloid Corp. 717
Huntington, Ind.

Metalloid fluids; high-speed grinder for diamond wheels.

Booth No.

Meyers, W. F., Co. 701
Meyers Bldg. Bedford, Ind.

Carbide drill bushings; carbide saws; cutters; tooling; wheel and tool former.

Michigan Tool Co. 1609
7171 E. McNichols Rd. Detroit, Mich.

Gear testing fixtures.

Michigan Tool Co. 107
7125 E. McNichols Rd. Detroit, Mich.

See Shear Speed Products Div.

Micro Switch Div. Minneapolis-Honeywell Regulator Co. 1708
Freeport, Ill.

Precision limit and control switches.

Microcast Div. Austenal Laboratories, Inc. 110
224 E. 39th St. New York 16, N. Y.

Precision investment castings of high temperature alloys, stainless steels, low tool steels.

Micrometrical Mfg. Co. 229
345 S. Main St. Ann Arbor, Mich.

Shop instruments for measuring: surface roughness, the characteristics of assembled ball bearings, waviness on small, symmetrical surfaces of rotation.

Micro-Poise Engineering & Sales Co. 1905
14851 Grand River Ave. Detroit 27, Mich.

Precision production balancing machines; adapter tooling for balancing operations.

Milford Rivet & Machine Co., The 2105
1000 Merwin Rd. Milford, Conn.

Fasteners; rivets; rivet setting machines.

Miller Fluid Power Co. 1360
2040 N. Hawthorne Melrose Park, Ill.

Air and hydraulic cylinders; fluid pressure boosters and accumulators; cylinders.

Milne, A., & Co. 429
745 Washington St. New York 14, N. Y.

High carbon steel; die steel; cold drawn preshaped steel sections; shank steel bars for inserting carbides.

Minneapolis-Honeywell Regulator Co. 1708
Freeport, Ill.

See Micro Switch Div.

Misal Machinery, Inc. 1919
1 E. 53d St. New York, N. Y.

Turret vertical milling machine; turret lathe; universal and vertical milling machines.

Modern Industrial Engineering Co. 1617
14230 Birwood Ave. Detroit, Mich.

Burring and chamfering machines.

Booth No.

Modernair Corp. 832
400 Preda St. San Leandro, Calif.
Air and hydraulic valves; air compressors and hydraulic power units; punch press controls; cylinders; air chucks, lubricators, filters and regulators, exhaust mufflers.

Mohawk Tools, Inc. 2003
910 E. Main St. Montpelier, Ohio
Drill tap; static display of special tools.

Moore Products Co. 136
H & Lycoming Sts. Philadelphia 24, Pa.
Pneumatic comparator gages; system for production leak testing.

Moore Special Tool Co., Inc. 1443
740 Union Ave. Bridgeport 7, Conn.
Precision jig borers and grinders; wheel dresser; rotary table; hole location accessories.

Morey Machinery Co., Inc. 970
410 Broome St. New York 13, N. Y.
Radial drill; ironworker; lathes; gear hobber; jig borers; millers; multispindle drill; surface grinder; hand screw machine; profiler and milling machine.

Morton Machine Works 113
2425 Wolcott Ferndale 20, Mich.
Handwheels and machine handles; steel balls; chuck jaws; jig, fixture and die components; screw machine products.

Motch & Merryweather Machinery Co., The 731
715 Penton Bldg. Cleveland 13, Ohio
Segmental saw blades; solid HSS saw blades; milling cutters; slitting and slotting saws.

National Broach & Machine Co. 1501
5600 St. Jean Ave. Detroit 13, Mich.
Broaching tools, fixtures and toolholders; gear laps; shaving cutters, measuring machines and sound testing machines; precision gears.

National Tool Co. 1739
11200 Madison Ave. Cleveland 2, Ohio
Special cutting tools; pocket comparator.

Neise, Karl A. 2004
381 4th Ave. New York, N. Y.
Facing, boring head; trepanning tools; die taper measuring instrument; micrometer; disk springs.

Nelco Tool Co., Inc. 1413
266 Center St. Manchester, Conn.
Carbide tipped face mills; shell, end, side and slab mills; slitting saws; lathe centers, drills; keyseat cutters.

New Plastic Corp. 2114
1026 N. Sycamore Los Angeles 38, Calif.
Soft face hammers with replaceable and interchangeable tips; impact hammer; metalworking tools; mallets; flexible oiler; drive punch.

Booth No.

New York Airbrake Co. 1226
230 Park Ave. New York 17, N. Y.
Hydraulic pumps; fluid motors; valves and cylinders.

New York Belting & Packing Co. 111
Passaic, N. J.
Timing belts for power transmission and synchronization; V-belts; special purpose and endless belts.

Newall Group Sales Ltd. 1012
Old Fletton Peterborough, Eng.
Jig boring machine; toolmakers' microscope; projection pantometer; comparators; rotary and inclinable table.

Niagara Machine & Tool Works 1242
637 Northland Ave. Buffalo 11, N. Y.
Punching, circle and squaring shears; air-actuated bar folder; power table; universal rotary machine; power slip roll former; hand tool.

Nichols-Morris Corp. 1431
P. O. Box 430 White Plains, N. Y.
Standard and toolroom miller; semiautomatic miller; twin mill.

Nicholson File Co. 959
Providence 1, R. I.
Hand steel files and rasps; rotary files and burs.

Nife, Inc. 1926
Lambert Ave. Copiague, L. I., N. Y.
High precision universal tool and cutter grinder.

Niles-Bement Pond Co. 1531 and 1535
W. Hartford 1, Conn.
See Kellerflex Diaform Sales Div. and Pratt & Whitney Div.

Nilsson Gage Co., Inc. 202
P. O. Box 505 Poughkeepsie, N. Y.
Gages and indicators.

Noble & Westbrook Mfg. Co., The 520
16 Westbrook St. E. Hartford 8, Conn.
Steel marking dies; marking machines for metal; numbering heads; steel stamps and die stamps.

Nobur Mfg. Co. 1972
717 N. Victory Blvd. Burbank, Calif.
Hole deburring and chamfering tools; countersinks.

Nord International Corp. 2059
449 Central Ave. Orange, N. J.
Hand filing machine; portable sheet metal cutter; sheet metal and plate working machine.

Norgren, C. A., Co. 712
3400 S. Elati St. Englewood, Colo.
Coolant and lubrication systems; bearings; gears; pneumatically operated equipment. Automatic drain for airline filters.

EXHIBITORS

Booth No.

Northwestern Tool & Engineering Co. 2122
117 Hollier Ave. Dayton 3, Ohio

Step strap clamps; step blocks; punch press sets; jig feet; fixture keys; latch bolts; special purpose studs, screws, nuts and washers; hand knobs.

Norton Co. 1430
1 New Bond St. Worcester, Mass.

Grinding wheels; heating elements; dressing sticks; refractory shapes for heat treating.

Oakite Products, Inc. 1347
19 Rector St. New York 6, N. Y.

Steel preserver, phosphate coatings; protective oil; rust removing compound; barrel burnishing oakite composition; steam-detergent cleaning.

Ohio Crankshaft Co., The 1554
3800 Harvard Ave. Cleveland 1, Ohio

See Tocco Div.

O'Neil-Irwin Mfg. Co. 1403
297 Eighth Ave. Lake City, Minn.

Hand and power-operated metalworking machines which cut, punch and form parts without dies.

Optical Gaging Products, Inc. 400
26 Forbes St. Rochester 11, N. Y.

Gear analyzer; contour projector; template filer; shaft checker; micro-gage charts; charts and fixtures for optical projection comparators.

Ortman-Miller Machine Co., Inc. 612
1222 150th St. Hammond, Ind.

Air and hydraulic cylinders; boosters; tandem, duplex adjustable-stroke and combination cylinders.

Osborn Mfg. Co., The 627
5401 Hamilton Ave. Cleveland 14, Ohio

Brushing machine; power brushes; maintenance brushes; paint and varnish brushes.

Ozalid Div. of General Aniline & Film Corp. 965
Johnson City, N. Y.

Copying machines and sensitized materials.

Pangborn Corp. 1412
10 Pangborn Blvd. Hagerstown, Md.

Blast cleaning machine; barrel and loader; blast cabinet.

Parker Machine Co., Inc. 1800
158 Pioneer St. Brooklyn 31, N. Y.

Horizontal boring mill; horizontal miller; V-ram shapers; engine lathe; universal tool and cutter grinder.

Pedrick Tool & Machine Co. 1442
3640 N. Lawrence St. Philadelphia 40, Pa.

Production bending machine.

Booth No.

Penn Scientific Products Co. 115
5941 Alma St. Philadelphia 24, Pa.

Industrial diamond products and accessories; jig and fixture details and parts; drill jig bushings.

Penton Publishing Co., The 1217
Penton Bldg. Cleveland 13, Ohio

Steel, *Machine Design*, *Foundry*, *New Equipment Digest* and *Automation* publications; technical books.

Perfex Gage & Tool Co. 428
123 Avery St. Mt. Clemens, Mich.

Wheel dressers; gages, thread and plain plug and ring gages.

Perkin-Elmer Corp., The 116
Norwalk, Conn.

Machine tool microscope; goniometer.

Permasco Div. Winter Wolff & Co., Inc. 630
76 Beaver St. New York 5, N. Y.

Millers; miniature jig borer; radial drill; jig boring table; shaper; coolant cleaner; prismatic lathe.

Perry Equipment & Engineering Co. 1925
3125 Brandes St. Erie, Pa.

Vibratory parts feeders; multitrack automatic parts feeders; electronic feeding and counting units; automatic batch counting equipment.

Pfauter, Hermann 2159
Ludwigsburg, West Germany

Gear hobbing machines; spline shaft hobber.

Pines Engineering Co., Inc. 605
601 Walnut St. Aurora, Ill.

Hydraulic tube bending machines and presses; tube and rod chamfering and deburring machines.

Pioneer Pump Div. Detroit Harvester Co. 1335
14300 Tireman Detroit 28, Mich.

Centrifugal pumps; coolant pumps; rotary lubricant pumps; oil separator units.

Pioneer Tool Engineering, Inc. 522
1601 E. El Segundo Blvd. El Segundo, Calif.

Cast aluminum tooling plate and bars; fabricated tools, jigs and dies.

Pneuma-Draulic Co., Div. of American Fabricating Co. 2007
Box 66 Detroit 6, Mich.

Air powered, hydraulically controlled feeds; solenoid valves.

Porter-Cable Machine Co., The 1324
Syracuse 8, N. Y.

Portable metal cutting band saw; electric tools; drills; sanders.

Portage Double Quick Tool Co. 128
1033 Sweitzer Ave. Akron 11, Ohio

Quick-change tools for milling machines; facing heads; turret lathes; comparator hole gage.

Booth No.

Porter-McLeod Machine Tool Co., Inc. 2060
Hatfield, Mass.

Single spindle automatic screw machine.

Portman Instrument Co., Inc. 2155
Town Dock Rd. New Rochelle, N. Y.

Optical comparators; optical form grinding machine; optical comparator charts.

Pratt & Whitney Div. Niles-Bement-Pond Co. 1531
W. Hartford 1, Conn.

Precision gages; gage blocks; measuring equipment; comparators; cutting tools; threading dies; milling cutters; special multiple-point cutting tools.

Precise Products Corp. 828
1328 Clark St. Racine, Wis.

Portable, electric grinder; miller and power quills; rotary tools in tungsten carbide.

Precision Detroit Co. 535
2126 Fairview Ave. Detroit 14, Mich.

Assembly presses; index tables.

Precision Diamond Tool Co. 1321
Box 274 Elgin, Ill.

Diamond dressers; diamond-shaped tools for turning and boring; special diamond tools; diamond wheels; hones and laps; diamond curve generators for lens.

Precision Grinding Wheel Co., Inc. 604
8301 Torresdale Ave. Philadelphia 36, Pa.

Grinding wheels.

Precision Spindle, Inc. 2006
Bur Dent Dr. Crystal Lake, Ill.

Carbide tool grinder; grinding machine spindles; vernier attachment for lathes.

Precision Tool and Mfg. Co. 114
1305 S. Laramie Ave. Cicero 50, Ill.

Procunier Safety Chuck Co. 1621
18 S. Clinton St. Chicago 6, Ill.

High-speed tapping attachments; high-speed tapping heads; foot-operated tapping machines; chucks and attachments; tap holders; stud setters.

Production Devices, Inc. 1971
North William St. Whitehall, N. Y.

Pneumatic vises.

Production Machine Co. 1731
Greenfield, Mass.

Abrasive belt centerless grinding machine.

Producto Machine Co., The 722
990 Housatonic Ave. Bridgeport, Conn.

Die sets and accessories; hand tappers; vises; feeding devices; ring punches and dies; scrap chopper, stock oiler, stock reel; pins and bushings.

Booth No.

Putnam Tool Co. 1717
2891 Charlevoix St. Detroit 7, Mich.

End mills; counterbores; reamers.

Quijada Tool Div., Gaines-Collins Co. 1816
5474 Alhambra Ave. Los Angeles, Calif.

Pipe threading and cutting machines.

R. B. Tool Co., Inc. 2004
41 E. Hartsdale Ave. Hartsdale, N. Y.

HSS and carbide cutting tools and their accessories; toolholders; tap chucks and holders; calipers; drill stops; and extractors; stops; adjustable workholder.

R and L Tools 134
1825 Bristol St., Nicetown Philadelphia, Pa.

Automatic and hand tools for screw machines; tool posts; tap and die holders; revolving stock stops; roller backvests; cutoff blade holders.

Racine Hydraulics & Machinery, Inc. 600
2000 Albert St. Racine, Wis.

Variable volume oil hydraulic pumps; directional check, feed, sequence and pressure regulating valves; pressure boosters; hydraulic power units.

Rahn Granite Surface Plate Co. 336
641 N. Western Ave. Dayton 7, Ohio

Black granite surface plates, angle plates, parallels, straight edges.

Raybestos-Manhattan, Inc. 1953
Passaic, N. J.

See Manhattan Rubber Div.

Raytheon Mfg. Co. 2101
Waltham, Mass.

Ultrasonic machine tool.

Reliant Industries 326
4947 Firestone Blvd. South Gate, Calif.

O-ring and snap ring groove gages; depth and snap indicator gages; tenth plug gages; master ring gages.

Rezolin, Inc. 1914
5736 W. 96th St. Los Angeles 45, Calif.

Casting resins for making industrial tools, models; thermoplastic material for drop hammer and stamp tools; phenolic material for core structure; epoxy laminating resins; mold preparation agents.

Richard Brothers Punch Div. Allied Products Corp. 1227
1560 E. Milwaukee Ave. Detroit 11, Mich.

Interchangeable punches and dies.

Richards, J. A., Co. 1632
903 N. Pitcher Kalamazoo, Mich.

Multiform benders for fabricating parts from flat, solid round, or tubular material.

EXHIBITORS

Booth No.

Rivett Lathe & Grinder, Inc. 1854
18 Riverview Rd. Brighton 35, Boston, Mass.
Air and hydraulic valves and cylinders; special valves and cylinders; pumping units.

Robertson Mfg. Co. Abrasive Div. 1912
Trenton 5, N. J.
Grinding wheels and segments.

Rockwell Mfg. Co. 1842
400 N. Lexington Ave. Pittsburgh 8, Pa.
See Delta Power Tool Div.

Ross Operating Valve Co. 800
120 E. Golden Gate Ave. Detroit 3, Mich.
Operating valves; hand, foot, cam, solenoid, and remote operated.

Rotor Tool Co., The 1246
26300 Lakeland Blvd. Euclid 23, Ohio
Pneumatic chippers; scalers; grinders; sanders; screwdrivers; nutsetters; impact wrenches; die grinders; high cycle portable grinders, buffers, sanders.

Rouse, H. B., & Co. 643
2214 N. Wayne Ave. Chicago 14, Ill.
Hand millers for cutting and machining metal parts; fixture setups for millers.

Rowe Machinery & Mfg. Co., Inc. 1754
1506 N. Industrial Blvd. Dallas, Tex.
Automatic coil stock cradles and straightening machines; automatic punch press feeds.

Royal Oak Tool & Machine Co. 523
29800 Stephenson Hwy. Royal Oak, Mich.
Radial relief grinders; fixtures; grinders; stands.

Joseph T. Ryerson & Son, Inc. 638
P. O. Box 8000-A Chicago 80, Ill.
Fast cutting leaded alloy steels.

S-P Mfg. Corp., The 806
12415 Euclid Ave. Cleveland 6, Ohio
Power and collet chucks; air and hydraulic cylinders; valves and accessories.

Sahlin Engineering Co. 406
267 Ferndale Ave. Birmingham, Mich.
Automatic unloading machine for small and medium size parts.

Sales Service Machine Tool Co. 1538
2363 University Ave. St. Paul 14, Minn.
Thirty-ton press with air friction clutch and variable speed drive; 20-ton mechanical clutch press; 10-ton press with air friction clutch; 5-ton floor press.

Booth No.

Salvo Tool & Engineering Co. 2071
26441 Gratiot Ave. Roseville, Mich.
Thread rolling, oil grooving, knurling, burnishing operations; screw machine and lathe attachments.

Sandvik Coromant Div. Sandvik Steel, Inc. 2011
20005 James Couzens Hwy. Detroit 35, Mich.
Carbide blanks; brazed tools; inserts; toolholders; turning tools; end and face mills; cutters; drills; reamers.

Schauer Mfg. Corp. 957
4500 Alpine Ave. Cincinnati 36, Ohio
Speed lathes.

Scherr Co., Inc., George 516
200 Lafayette New York 12, N. Y.
Inspection equipment; measuring tools; gear hobbing machines.

Schrader's, A., Son, Div. Scovill Mfg. Co. Inc. 723
470 Vanderbilt Ave. Brooklyn 17, N. Y.
Pneumatic press controls; air cylinders; operating valves; associated air line products.

Schramm, Inc. 1230
West Chester, Pa.
Air compressors.

Scovill Mfg. Co., Inc. 723
470 Vanderbilt Ave. Brooklyn 17, N. Y.
See A. Schrader's Son Div.

Scully-Jones & Co. 1530
1901 S. Rockwell Chicago 8, Ill.
Precision holding tools: torque drivers for taps; chucking and recessing tools; floating holders; drill stops; tool-setting gages; tap driving tools.

Seibert & Sons, Inc. 432
Chenoa, Ill.
Spindles, drive shaft assemblies and components for multiple spindle drilling machines; drivers, sockets, sleeves, toolholders, spindle extensions.

Sentry Co., The 533
62 Main St. Foxboro, Mass.
Electric high-speed steel hardening furnace.

Service Diamond Tool Co. 101
2505 Burdette Ferndale, Mich.
Diamond hardness testing machines; accessories; dressing tools.

Service Machine Co. 1716
7627 S. Ashland Chicago 20, Ill.
Punch presses.

Severance Tool Industries, Inc. 813
706 Iowa Rd. Saginaw, Mich.
Carbide hand files; countersinks; deburring and seating tools; dressers; carbide reamers.

Booth No.

Shear Speed Chemical Products Div. Michigan Tool Co. 107
7125 E. McNichols Rd. Detroit 12, Mich.
Cutting fluid.

Sheffield Corp., The 325
Springfield and Thomas Dayton 1, Ohio
Pneumatic, electric, electronic, mechanical and optical gaging and inspection equipment; dieheads, taps and threading tools; grinding devices.

Sheldon Machine Co., Inc. 812
4258 N. Knox Ave. Chicago 41, Ill.
Lathes; milling machines; shapers.

Sheridan Products Co., Inc. 522
1054 E. Hyde Park Blvd. Inglewood 3, Calif.
Foot adapter for drill motors and drill presses; drill guides; chip chasers; rivet finishers; detonating units; cement and catalyst.

Siewek Tool Co. 408
2862 E. Gd. Blvd. Detroit 2, Mich.
Rapid clamping drill jigs; automatic fixture locks; fixture clamps and details.

Simonds Abrasive Co. 314
Tacony and Fraley Sts. Philadelphia 37, Pa.
Grinding wheels; points; segments, abrasive grain.

Simonds Saw and Steel Co. 314
470 Main St. Fitchburg, Mass.
Metal cutting circular and band saws; hack saw blades; files; rotary and squaring shears; die steel.

Simplex Machine Tool Corp. 1555
4548 W. Mitchell St. Milwaukee 14, Wis.
Boring machines; boring heads; special tooling.

Size Control Co., Div. of American Gage & Machine Co. 332
2500 W. Washington St. Chicago 12, Ill.
Plain and thread plug and ring gages; setting masters; gear and thread wires, snaps, special gages; gage cabinet sets.

Skinner Chuck Co., The 1808
344 Church St. New Britain, Conn.
Chucks; chucking equipment; solenoid valves.

Smit, Anton, & Co., Inc. 404
333 W. 52nd St. New York 19, N. Y.
Diamond tools and wheels, and applications.

Socony-Vacuum Oil Co., Inc. 1327
26 Broadway New York, N. Y.
Lubricating oils and greases; cutting and metal processing fluids; liquid mediums for hydraulic systems; metal preservatives and protectives.

Booth No.

Sorensen Center-Mikes, Inc. 233
264 Kossuth St. Bridgeport 8, Conn.
Center distance gages; collet chuck blocks; protractor; sine fixtures.

South Bend Lathe Works 1709
South Bend, Ind.
Machine tools including lathes, drill presses, shapers, pedestal grinders, and accessories.

Sperry Corp., The 705
1400 Oakman Blvd. Detroit 32, Mich.
See Vickers Inc. Div.

Spiral Step Tool Co. 1351
5400 N. Damen Chicago, Ill.
Special cutting tools: step tools; form tools.

Standard Electrical Tool Co., The 538
2488 River Rd. Cincinnati 4, Ohio
Tool grinders; finishers; vertical spindle rotary surface grinder; speed lathe; tool post grinder; motorized spindles with feeds.

Standard Gage Co., Inc., The 238
70 Parker Ave. Poughkeepsie, N. Y.
Dimensional, indicating, adjustable and fixed limit gages; dial indicators; comparators.

Standard Parts Co. 911
P.O. Box 531 Bedford, Ohio
Jig and fixture components; mill fixture bases; box jigs; clamp assemblies; fixture keys; torque screws; C washers; jig legs and leg plates; chuck jaws.

Standard Pressed Steel Co. 1539
Jenkintown, Pa.
Screw products; self locking nuts; spring pins; shop equipment of steel.

Staples Tool Co., The 207
2851 Massachusetts Ave. Cincinnati 25, Ohio
Circular cutting tools; expansion reamers; core drills.

Starrett, L. S., Co., The 211
Athol, Mass.
Mechanics' hand measuring tools and precision instruments; dial indicators; steel tapes; hacksaws; band saws and knives; precision ground flat stock.

Steel City Testing Machines, Inc. 1316
8817 Lyndon Ave. Detroit 21, Mich.
Machines for testing physical properties of metals; proving rings and accessories.

Steel Products Engineering Co. 622
1150 W. Main St. Springfield, Ohio
See Brehm Die Div.

Stewart-Warner Corp. 1319
1826 Diversey Parkway Chicago 18, Ill.
See Alemite Div.

EXHIBITORS

Booth No.

Stimpson, Edwin B., Co., Inc. 1203
100 Franklin Ave. Brooklyn 5, N. Y.
Screw machine parts; stampings; terminals; grommets, ferrules, posts; fasteners; attaching machines.

Stone Machinery Co., Inc. 541
Syracuse, N. Y.
Swing and cross feed cutoff machine.

Strong, Carlisle & Hammond Co.
1392 W. Third St. Cleveland 13, Ohio
See Mac-It Div.

Sub Zero Products Co. 2151
3932 Reading Road Cincinnati 29, Ohio
Low temperature chilling equipment for industrial applications.

Sunnen Products Co. 1803
7910 Manchester Ave. St. Louis 17, Mo.
Honing machines.

Super Tool Co. 623
21650 Hoover Rd. Detroit 13, Mich.
Carbide tools; milling cutters; end mills; reamers; counterbores; centers; drills; ejector tools.

Superior Hone Corp. 1320
1604 Elreno Ave. Elkhart, Ind.
Honing machines; attachments for drill presses; accessories for this equipment.

Superior Steel Products Corp. 103
2754 S. 19th St. Milwaukee 15, Wis.
Die sets.

Swanson Tool & Machine Products, Inc. 1968
Erie, Pa.
Turret indexing units and accessories; bench presses; hopper feeds; turntable units; inspection equipment; concentricity checking fixtures.

Swartz Tool Products Div. Jefferson Corp. 843
13330 Foley Ave. Detroit 27, Mich.
Locks and fixtures; special automation fixtures; special machines and engineering services.

Swedish Gage Company 132
10641 Haggerty Ave. Dearborn 1, Mich.
See C. E. Johansson Gage Co., Div. of

Syntron Co. 1960
Homer City, Pa.
Vibratory small parts feeders; portable power tools; power conversion units; balanced conveyors.

Taft Peirce Mfg. Co., The 210
Woonsocket, R. I.
Air gage inspection units; fixed and thread gages; gage blocks; magnetic chucks; toolroom equipment; machine tool accessories.

Booth No.

Taylor Dynamometer and Machine Co. 127
6411 River Pkwy. Milwaukee 13, Wis.
Precision drilling machines; small hole drilling equipment; universal balancing machines.

Tenney Engineering, Inc. 1326
1090 Springfield Rd. Union, N. J.
Low temperature chambers for cold-treating and shrink-fitting utilizing latest low-temperature refrigerating systems.

Texas Co., The 831
135 E. 42nd St. New York 17, N. Y.
Cutting oils; quenching oils; hydraulic oils; drawing compounds.

Thread-All Sales Co. 2120
448 W. Larned St. Detroit 26, Mich.
Tapping machines; floating toolholders.

Tinius Olsen Testing Machine Co. 1213
Easton Rd. Willow Grove, Pa.
Horizontal and vertical balancing machines with electronic indicators; universal and Brinell hardness testing machines.

Tocaro Machinery Co. 1961
110 N. 6th St. Philadelphia 6, Pa.
Drills; cutters; reamers; taps; dies; machine shop and toolroom equipment; turret and automatic screw machine tools.

Tocco Div., The Ohio Crankshaft Co. 1554
3800 Harvard Ave. Cleveland 1, Ohio
Induction heating equipment for surface hardening, brazing, welding, heat treating, melting, forging and forming; ultrasonic cleaning equipment.

Tomkins Johnson Co., The 1247
Jackson, Mich.
Riveters and clinchers; air and hydraulic cylinders; reamers; millers; remote controls.

Torit Mfg. Co. 2158
292 Walnut St. St. Paul 2, Minn.
Dust control equipment; fume exhausters; air-gas, oxy-gas and acetylene torches for soldering, light brazing; valves for compressed air, gases and acetylene.

Torrington Co., The 964
Torrington, Conn.
Rotary swaging machines.

Transmares Corp. 2159
15 William St. New York 5, N. Y.

Tubular Micrometer Co. 328
St. James, Minn.
Measuring instruments for quality control; micrometers for inside and outside measurements; vernier tools; rules and scale; gages; dial indicators.

Booth No.

Tubular Rivet & Stud Co. 2068
Wallaston 70, Mass.

Tubular and split rivets; riveting machines; electrical contacts; production machine work; plug gages.

Tumbling Sales & Service Co. 2063
King St. Greenwich, Conn.

Tumbling barrels; barrel finishing compounds; hoist pan and separators; anti-rusts; steel pins and shapes.

Twentieth Century Mfg. Co. 1013
3716 Montrose Ave. Chicago 18, Ill.

Machine chucking and stub screw machine reamers in decimal sizes; counterbores; lights for inspection and die work; die stops; special cutting tools.

Ty-Sa-Man Machine Co. 1953
Knoxville, Tenn.

Traverse feed cutoff saw with horizontal stroke.

Union Carbide and Carbon Corp. 738
30 E. 42nd St. New York 17, N. Y.

See Haynes-Stellite Div.

Union Mfg. Co. 961
Church at Railroad New Britain, Conn.

Die sets; set springs, bushings and posts; lathe chucks; air chucks.

United Diamond Tool Corp. 2015
51 Prospect Ave. Lynbrook, L. I., N. Y.

Diamond products for industry.

U. S. Tool Co., Inc. 1254
Ampere (East Orange), N. J.

Slide feed; stock straightener; automatic stock reels; multi-stop; scrap chopper; power driven straighteners; automatic coil cradles.

Universal Cyclops Corp. 1052
Bridgeville, Pa.

Universal Vise & Tool Co. 958
Parma, Mich.

Machine, drill press, bench and toolroom vises; drill press workholders; milling and boring heads; vertical milling machines; metal-cutting band saws; lathe steady rests.

Univertical Machine Co. 745
14841 Meyers Rd. Detroit 27, Mich.

Copper and lead alloy special hammers; lathe cut-off tool.

Utica Drop Forge & Tool Corp. 809
Utica 4, N. Y.

Pliers, wrenches, metal joining tools, hand tools for cold welding process; buttweld, lapweld, tipweld and wirewrap tools.

Booth No.

V & O Press Co., The, Div. of Emhart Mfg. Co. 1056
Hudson, N. Y.

Automatic feed mechanisms; high-speed notching and high-speed blanking presses.

Valvair Corp. 2116
454 Morgan Ave. Akron 11, Ohio

Control valves.

Vanadium-Alloys Steel Co. 420
Rezak Ave. Latrobe, Pa.

Film of tool steel development. Free machining, tooling, steels. Results of research and development of prealloyed steel powder metallurgy.

Van Keuren Co., The 109
176 Waltham St., Watertown Boston 72, Mass.

Wire and taper insert plug gages; thread and measuring wires; fused quartz optical flats; light wave equipment and micrometers; gage blocks; root diameter wires; calibrated steel balls.

Vapor Blast Mfg. Co. 1747
3025 W. Atkinson Milwaukee 16, Wis.

Vapor blast liquid honing machines, processes and applications.

Vascoloy-Ramet Corp. 403
800 S. Market St. Waukegan, Ill.

Vertical toolholder with built-in chip control; toolholder inserts and blanks; carbide cutting tools; blanks; wear resistant parts; wire drawing dies; tool bits; investment castings.

Versa-Mil Co. 1720
33 W. 42nd St, New York 36, N. Y.

Portable machining units for milling, drilling, grinding, slotting and shaping.

Vickers, Inc. Div. of the Sperry Corp. 705
1400 Oakman Blvd. Detroit 32, Mich.

Hydraulic pumps and controls.

Victor Adding Machine Co. 411
2500 S. Union Ave. Alliance, Ohio

See McCaskey Register Div.

Viking Tool Co., The 542
P.O. Box 286 Shelton, Conn.

Tool bits and blanks; blades; boring heads, mills and tools; replacement tips; toolholders; keyway and milling cutters; cutting tools.

Vinco Corp. 121
9111 Schaefer Hwy. Detroit 28, Mich.

Camshaft comparators; dividing heads; involute checkers; gear rolling fixtures; wheeldressers; spline gages; indexing table; master gears.

Vlier Engineering, Inc. 129
4552 Beverly Blvd. Los Angeles 4, Calif.

Spring plungers and spring stops; torque thumb screws; fixture keys; toggle pads; clamps.

EXHIBITORS

Booth No.

Wade Tool Co., The 616
49 River St. Waltham 54, Mass.

Hand screw machines; precision lathes; precision profilers.

Wahlstrom Tool, Div. American Machine & Foundry Co. 834 and 838
511 Fifth Ave. New York 17, N. Y.

Waldes Kohinoor, Inc. 424
47-16 Austel Pl. Long Island City 1, N. Y.

Retaining rings; application and assembly tools.

Wales-Strippit Corp. 1830
345 Payne Ave. North Tonawanda, N. Y.

Fabricators; drilling machines; twin column presses; shears; hydra spring; punch and die units.

Walker-Turner Div., Kearney & Trecker Corp. 1512
639 South Ave. Plainfield, N. J.

Ward Leonard Electric Co. 137
South St. Mount Vernon, N. Y.

See Industrial Chrome Div.

Warner & Swasey Research Corp., The 135
34 W. 33rd St. New York 1, N. Y.

Measuring instruments; automatic gaging and measuring machines; controls; machinery.

Weatherhead Co., The 1339
300 E. 131st St. Cleveland 8, Ohio

Tube fittings; hydraulic hoses and assemblies; reusable hose ends.

Webber Gage Co. 324
12900 Triskett Rd. Cleveland 11, Ohio

Gage blocks and accessories.

Webber Mfg. Co., Inc. 2067
2740 Madison Indianapolis, Ind.

Low temperature industrial freezers and liquid coolers.

Weber Engineered Products, Inc. 518
800 Evans St. Cincinnati 4, Ohio

Machined gears, shafts, worms, worm wheels; machined castings; assembled transmissions.

Wells Mfg. Corp. 1447
Three Rivers, Mich.

Horizontal band saw machines; band saw blades; automatic stock projection equipment.

Wesson Co. 1255
1220 Woodward Heights Blvd. Ferndale 20, Mich.

Milling cutters; blades; carbide turning, facing and shaping tools; reamers; counterbores; form tools; blade locking devices; inserts for toolholders.

Booth No.

West Point Mfg. Co. 1746
26935 W. Seven-Mile Rd. Detroit 19, Mich.

Jigs and fixture components; toggle clamps; toggle pliers; leaf jigs.

Westplex Corp. 2012
12 Commercial St. Rochester 4, N. Y.

Molded nylon gears including spur, helical and double helical units; molded plastics items.

Whirl-Dex Co. 1911
14847 Heyden Detroit 23, Mich.

Indexing tool; rotating device for spinning work and holding work while grinding.

Whiton Machine Co., The 508
New London, Conn.

Air-operated chucks and cylinders; hand-operated chucks; micro-jaw set.

Wickman Mfg. Co., The 608
10325 Capital Ave. Detroit 37, Mich.

Diamond wheels; carbide grinding and lapping machines; tool and cutter grinders; tapping attachments; floating reamers; screw automatics.

Willey's Carbide Tool Co. 1455
1340 W. Vernor Hwy. Detroit 1, Mich.

Carbide tipped blanks, broaches, centers; dies; drills; gages and bushings; mandrels; mills; rest blades; reamers; saws; tips; boring cutoff and formed tools; diamond wheel dressing tools.

Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc. 1802
Bridgeport 2, Conn.

Hardness testers—Rockwell, Tukon and superficial.

Wilton Tool Mfg. Co. 804
925 Wrightwood Ave. Chicago 14, Ill.

Manual and automatic machinists' vises and work positioning equipment.

Winter-Wolff & Co., Inc. 630
76 Beaver St. New York 5, N. Y.

See Permasco Div.

Wise, Henry H., Co. 1953
944 Wilshire Blvd. Los Angeles 17, Calif.

Abrasive cutoff machine.

Woodworth, N. A., Co. 221
1300 E. 9 Mile Rd. Ferndale 20, Mich.

Diaphragm chucks and arbors; jigs; spline arbors; spindle inspection fixtures; differential air control; cylindrical and thread plug and ring gages.

Zagar Tool, Inc. 1620
24000 Lakeland Blvd. Cleveland 23, Ohio

Collet holding and indexing fixtures; accessories; broaching machines and tools; drill heads; self-clamping drill fixtures; hydraulic drilling machines.

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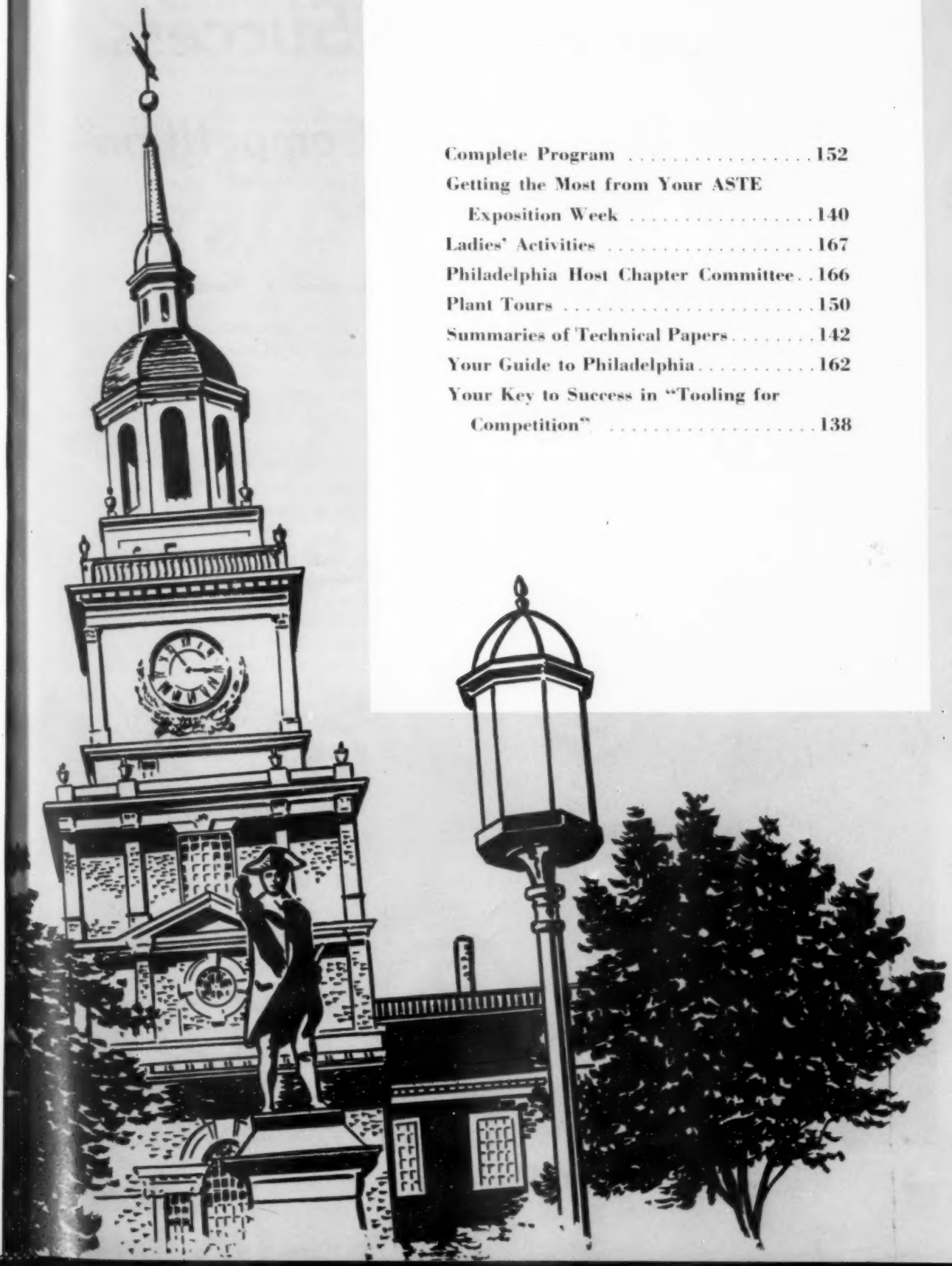
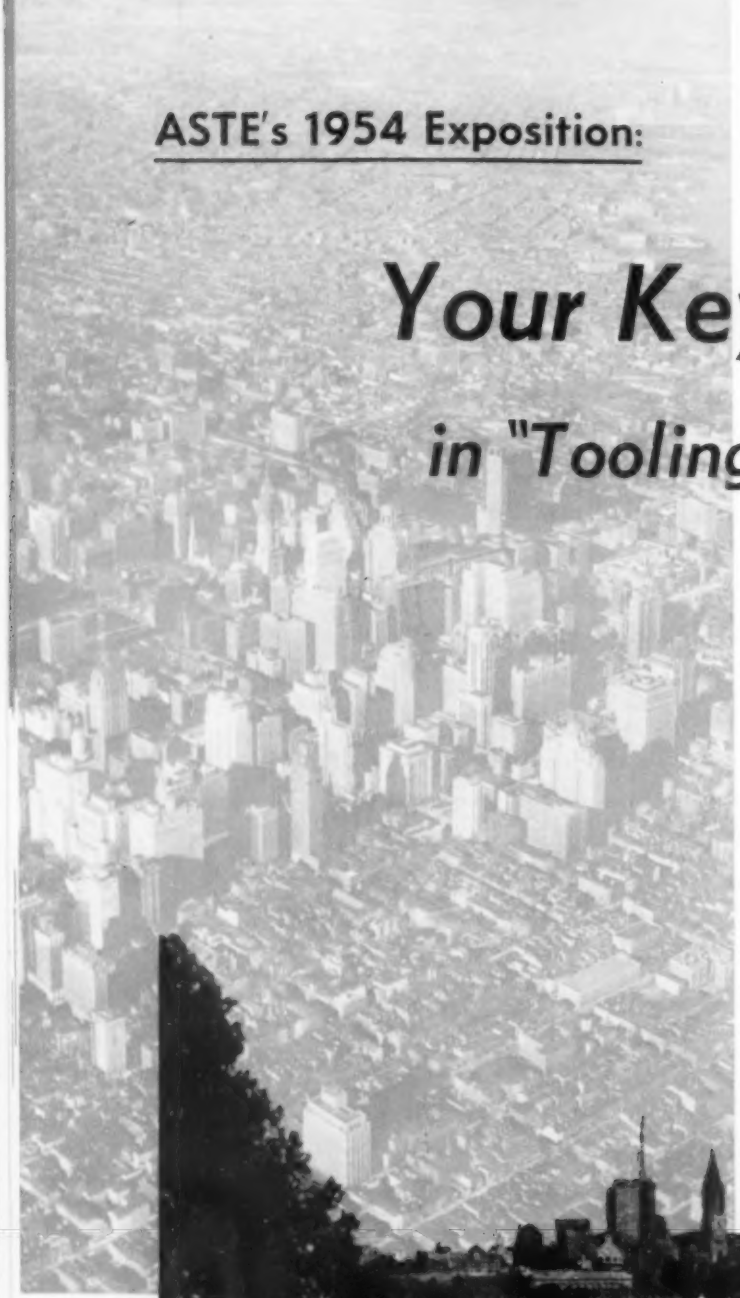


ASTE's 1954 Exposition:

Your Key to Success

in "Tooling for Competition"

By Nancy L. Morgan



This view of Benjamin Franklin Parkway shows the silhouette of Philadelphia's skyline in the background.

More production at lower cost is unquestionably the brightest lure the 1954 Industrial Exposition holds for the thousands of members who will attend the event at Philadelphia's Convention Center. It opens on April 26 for the greatest five days in ASTE history.

Unprecedented interest in "Tooling for Competition" has resulted in a record-breaking number of exhibitors—more than 470 will be on hand. Exhibit space was sold out in a matter of weeks after the first official announcement was made.

Many new machines, tools and processes will be unveiled for the first time. Newest types of cutting tools, machine tools and their accessories, inspection equipment, presses, and the latest developments in workholding and other devices will be on display.

Actual Production of Carbide Tools

One of the most unusual features of the show will be the actual production of carbide tools, from the raw material to the crating of finished tools for shipment. Believed to be the first exhibit of its kind ever assembled for any industrial exposition, the production line will be located in the South Exhibit Hall Extension.

More than 25 firms are participating. The Carbide Tool Co. of Detroit will supervise the operating exhibit under the sponsorship of Carbide Processors Supply Co., also of Detroit.

Describing production plans, A. R. Conti, president of Carbide Tool Co., said, "We will make carbide tools each day of the Exposition. These will include tools of various descriptions for numerous firms. For example, there will be 4,000 carbide tools for the Ford Motor Co., 3,000 for Lees Bradner Co. and various quantities for Electromotive Div. of General Motors, Caterpillar Tractor Co. and Pratt & Whitney Div. of Niles-Bement-Pond Co. More than 1,500 pounds of steel will be cut each day to keep the production line flowing smoothly."

Only new equipment—the latest in machines and precision control accessories—will be used. Participating firms will furnish their own personnel to operate their machines.

Everyone interested in carbide tools, and the equipment used to produce carbide tools, will find ample opportunity at this exhibit to see firsthand the actual production.

Newest Equipment and Machines

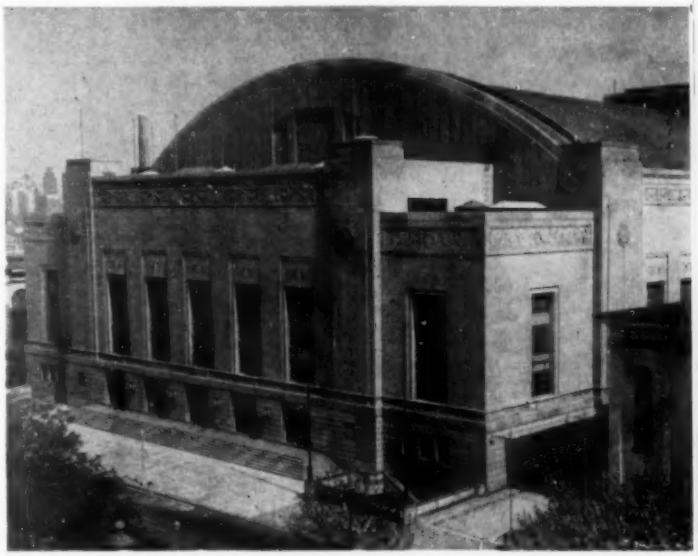
Another hall of the Convention Center will be occupied by manufacturers of precision gaging and inspection equipment ready to demonstrate newest means and methods for attaining and maintaining the high quality control accuracy needed to meet today's stiff competition.

Throughout the lower halls will be found the newest in metal-cutting machines and tools for faster machining of the new tougher materials coming into use today as well as the standard materials. Grinding and finishing equipment and supplies, presses, abrasives, cutting fluids—just about everything used in production will be displayed.

Outstanding Industrial Conferences

Continuing its policy of presenting timely conferences and discussions on the latest technical advances and production problems, the Society has arranged for 49 papers and five panel discussions.

More than a year of planning has been devoted to making the conferences and panel discussions timely and comprehensive. Top engineers and executives in the fields of plant management, automation, precision control, cutting and grinding and other phases of manufacturing were sought out. Each speaker is a recognized expert in his field.



Philadelphia's Convention Center will be one of the busiest places in town during the ASTE Industrial Exposition and Annual Meeting. A record-breaking crowd is expected to attend the five-day event.

Topics for the conferences cover the entire field of manufacturing practices, from first designs of the product to its final inspection "OK." Some dramatic highlights will be: full automation, participation in employee planning, and industrial uses of nucleonics. Production problems will be analyzed. Each of the "stiff competition" technical developments will be covered by at least one paper.

Backing up this largest ASTE Industrial Exposition is the largest membership the Society has ever had. More than 28,000 are members of ASTE's 112 chapters in the United States and Canada.

Getting the *Most*

ASTE's Industrial Exposition and Annual Meeting this year will offer more to see and more to do than ever before.

Over 470 exhibits—49 conferences starring the nation's top production and processing authorities—six interesting tours of manufacturing facilities in the Philadelphia area—the University of Pennsylvania Carbide Seminar—and a score of unofficial activities such as sightseeing, parties and special dinners will vie for a place on the busy convention goer's program.

Here a few pointers to help you get the most from your ASTE week in Philadelphia.

A record-breaking attendance is expected, so make your plans to attend now. All travel arrangements should be made as early as possible. Send your request for hotel accommodations, if you haven't already, to: Housing Bureau, Philadelphia Convention and Visitors Bureau, Architects Building, Philadelphia 3, Pa.

Mail your order for banquet tickets and a check or money order for $7.50 per plate to ASTE National Headquarters, 10700 Puritan Ave., Detroit 38, Mich.

When you're ready to leave for the convention, double-check your timetable, make sure you have all the necessary acknowledgments and tickets.

If your wife is going along, and even if she isn't, show her the special program of ladies' activities on page 167 and the guide on things to see and places to go on pages 162 through 165. It'll be spring in Philadelphia, a perfect time for her to visit the wonderful town.

Map out your own plans well in advance to cover the exhibits, tours and talks that will help you most. Read the program carefully to find out what's going on when. It may be a good idea to write a memo to yourself, working out on paper just what you want to get out of the program and planning your time accordingly.

from Your ASTE Exposition Week

At the conferences and the Exposition, too, don't just watch and listen—participate! Ask questions, steer the talk to what's important to you. Relate what the speaker says to your problems. Make mental or written notes on the points you would like amplified during the discussion period.

Stop at all of the exhibits you can, examine the displays, talk to the representatives who are there especially to answer your questions. If you can avoid it, don't try to do it all at one time. Split up your hours at the Industrial Exposition and you'll enjoy it more and learn more, with a minimum of fatigue.

Don't forget to visit the ASTE Center where you'll find lounge facilities for meeting your friends and headquarters personnel on hand to answer all of your quesions on chapter services. Information about THE TOOL ENGINEER, its technical articles and news coverage, departments and special features, will also be available.

Talk shop! The scraps of information, notes on organization changes and other news which comes from the informal conversations are often the most valuable material of all. And for a fresh viewpoint and a new approach, talk with those from other companies and chapters.

Of course, you won't omit the social side lines in your plans but don't overdo them. An important part of the convention week, sightseeing and partying are best done with moderation and in spare time, not as paramount items on your daily calendar.

Your part in the Exposition and Annual Meeting won't be over when you pack your bags and take off for home. There's still that vital follow-through.

When you get back, organize your notes for reports to your boss and chapter. You may want to outline the ways in which ideas you picked up can be put to work.

If you have any suggestions on how ASTE Expositions and Annual Meetings can be improved, tell your chapter's National Delegate. One of his most important jobs is to relay your ideas to national headquarters. In this way ASTE can give you even better national programs in the years to come.

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Summaries of

Technical Papers

Summaries of nearly all of the technical papers to be presented at the ASTE Annual Meeting are published on the following eight pages, together with photographs and brief biographical sketches of most of the speakers.

"Rolled Extrusion of Thin-Walled Parts" by W. N. Parker, Development Engineer, RCA Victor Tube Div., Radio Corp. of America, Lancaster, Pa. This paper describes a process that greatly simplifies the fabrication of fragile, cylindrical parts having wall thicknesses of 0.001 inch or less. Termed Uniskan, this method involves simple tools mounted in a drill press. Designs and uses of typical extrusion tools are discussed.

"Rubber-Clamping Assembly of Thin-Walled Parts" by F. R. Simpson, Director of Research & Development, The Trojan Corp., Philadelphia, Pa. Thin-walled parts can be joined simply by clamping rubber rings or plugs around or inside the joint and subjecting the rubber to pressures of about 30,000 psi. This paper describes the materials that are used in the process, limitations of the method, errors of design that should be avoided and restraining fixtures suitable to the process.

"Surface Finish Control with Blast Cleaning" by A. P. Neumann, Chief Engineer, Vapor Blast Mfg. Co., Milwaukee, Wis. A suspension of Novaculite can be used to finish surfaces of tools and production parts. Typical applications of this process are described, such as: finish honing of carbide tools with 200 percent increase in tool life, reducing surface finish on Ketos metal from 35 to 17 microinches, rms, and preparing parts for electroplating.

"Ultrasonic Techniques in Industrial Cleaning" by Dr. W. L. McCracken, Director of Research, Detrex Corp., Detroit, Mich. This paper—discuss-

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WILLIAM N. PARKER, an electrical engineering graduate of the University of Illinois, has written many technical papers and holds some dozen patents on electronic devices and mechanical techniques. He has been associated with leading companies in the electronics industry for more than 25 years.

FRANK R. SIMPSON is a registered professional engineer with over 30 years of design and development experience on major projects for such companies as Westinghouse, De Laval, Baldwin Locomotive and The Franklin Institute. He has authored articles on machinery, textiles and manufacturing for various engineering magazines.

ALFRED P. NEUMANN received his mechanical engineering education in Berlin, Germany, where he also took two years of post graduate work. A registered professional engineer, he has spent nearly a decade working on development, design, and production of standard and special machinery.

Parker

Simpson

Neumann

McCracken

Pearse

Dowd

WILLIAM L. McCRACKEN holds a B.S. degree from Missouri School of Mines and Metallurgy, a M.S. and Ph.D. degrees in chemical engineering from Iowa State College. He has given many lectures on industrial cleaning techniques and finishing problems throughout the United States and has spent much time in South America and Europe on business.

ROBERT F. PEARSE received his Ph.D. degree from the University of Chicago and has served industry as an executive development coordinator and as a director of psychological services. He has done considerable writing and speaking about the strong influence of personality on the effectiveness of individual executives in industry.

EDWARD M. DOWD has been a tool designer and manufacturing engineer for more than 35 years. Now executive vice president of Lapointe Machine Tool Co., he was at one time associated with Rolls-Royce Co. and American Bosch Corp.

Shaffer

Segsworth

Sorenson

BERNARD W. SHAFFER, a registered professional engineer, holds a M.S. degree in mechanical engineering from Case Institute of Technology and a Ph.D in applied mathematics from Brown University. A member of many technical societies, he has taught at several universities, including New York University where he is an associate professor of mechanical engineering.

R. S. SEGSWORTH, a registered professional engineer, spent nearly five years in mining and prospecting work in northern Ontario before studying mechanical engineering at the University of Toronto. After graduation he spent one year on the staff of the university and then joined the General Engineering Co. where his responsibilities now involve design, development and research in the industrial field.

PHILLIPS N. SORENSON, a graduate of Heidelberg College, has been associated with Tocco Div. of the Ohio Crankshaft Co. for the past 15 years, and has been in charge of the application and test engineering department since 1949.

ing all phases of industrial cleaning with ultrasonics and the equipment associated with the process—has been abstracted and appears on page 66 of this issue.

"A Program for Developing Tool Engineers into Manufacturing Executives" by Dr. R. F. Pearse, Sr. Associate, Worthington Associates, Inc., Chicago, Ill. This paper paints a detailed portrait of a tool engineer with particular emphasis on his personality characteristics. Based on case studies, this report will show how various characteristics of value to a tool engineer must be subdued in an individual who is shifting to management functions.

"Scanlon Employee Relations Plan at Different Production Levels" by E. M. Dowd, Executive Vice President, Lapointe Machine Tool Co., Hudson, Mass. This paper covers a plan that embraces both incentive factors and proper communication among all personnel on production problems. In addition to indicating how to implement such a plan, examples are given to show its operation in low, medium and high-production plants.

"Recent Developments in Analysis of Chip Formation" by Dr. B. W. Shaffer, Project Director, Research Div., College of Engineering, New York University, New York, N. Y. Basic concepts behind some of the recent analyses of chip formation during orthogonal machining are presented for planing and boring operations. Both the simple shearing solution and the built-up nose solution are considered for planing, while only the simple shearing solution is considered for boring.

"Process Applications for Dual-Frequency Induction Heating" by R. S. Segsworth, Director of Research, General Engineering Co., Ltd., Toronto, Ontario, Canada. This paper describes the basis for selection of the optimum frequency for a given job in induction heating from both the theoretical and practical points of view. It will show that for magnetic materials a low frequency should be used so long as the temperature of the material is below the Curie point and that a higher frequency should be used when the temperature of the material is high enough so that it is no longer magnetic. Typical examples of dual-frequency induction heating will be presented.

"High-Production Tooling for Induction Heating" by P. N. Sorenson, Chief Test Engineer and C. E. Glick, Production Engineering Manager, Tocco

technical papers

Div., The Ohio Crankshaft Co., Cleveland, Ohio. The authors will describe several high-production induction heating machines to indicate the rapid progress in this specialized field. Details of equipment design, selection of materials and the reasons for each choice will be given.

"How to Plan a Transfer Machine" by D. E. Hawkinson, Vice President, Machine Tool Sales, Greenlee Bros. & Co., Rockford, Ill. A brief history of the transfer machine will be given to point up the reasons for its rapid development. Proper planning—at the sales engineer level, in cooperation with the customer and by the designer—will exploit the advantages and minimize the disadvantages of the transfer type machine.

Philosophy of Design

"Creativity in Mechanical Design" by H. A. Oldenkamp, Director of Engineering, and Leo Strauss, Project Manager, General Engineering Laboratories, American Machine & Foundry Co., Greenwich, Connecticut. The broad philosophy behind this paper is an attempt to inspire machine designers with the desire to produce practical low-cost designs with a low design cost. The authors indicate when it is advisable to begin a new design from an entirely new approach and when the new designs should be integrated conventional approaches. The importance of various design factors and product functions are described and discussed.

Click

Hawkinson

Oldenkamp

CLARENCE GLICK joined Tocco in 1940 after spending 20 years with various companies, designing steel mill, foundry and automotive equipment and special automatic machinery. He has complete charge of production engineering at Tocco.

DONALD E. HAWKINSON has been associated with Greenlee Brothers & Co. and the machine tool industry for nearly 30 years. Now vice president in charge of machine tool sales, he has also served as assistant chief engineer and sales manager. He is past chairman of the Rockford ASTE chapter.

H. A. OLDENKAMP was chief engineer for American Machine & Foundry Company's Brooklyn plant before his appointment as director of engineering for AMF's new Development Engineering Laboratory in Greenwich, Conn. He is a graduate of Fenn College with degrees in both electrical and mechanical enginering.

"Fastening Techniques for Small Assemblies" by V. L. Bradford, Vice President in Charge of Sales, Milford Rivet & Machine Co., Milford, Conn. The philosophy to be presented by this paper is that rivets should be selected as the fastener of assembled products before the design is frozen. Examples are given that show typical cases where a desire to use rivets in production was impossible because of the design of the product, but where simple design changes could have made riveting a simple and inexpensive fastening method.

"The Possibilities for Castings in Airframe Design" by A. H. Petersen, Design Group Engineer, Lockheed Aircraft Corp., Burbank, California. This paper briefly explains the importance of weight reduction in aircraft and indicates the desirability of using castings. Design trends and possible increases in applications of this flexible production process are discussed.

"Nucleonics Invade the Tool Engineering Field" by L. S. Goldring, Radiochemist, Nuclear Development Associates, Inc., White Plains, N. Y. This paper describes the characteristics of nuclear radiation and indicates how such radiations can be practically applied by the tool engineer at the present time. The paper shows that with a proper understanding of nucleonics, radiations can be usefully applied in almost unlimited production fields.

"Tracer-Controlled Pantographic Milling" by A. D. Gunderson, Asst. Chief Engineer, George Gorton Machine Co., Racine, Wisconsin. Since the use of pantograph machines is relatively new, this paper gives a short history of its development and indicates the present state of the process. Standard and special machines are described, including some with speeds up to 45,000 rpm for single and multiple spindles, others with both two and three-dimensional automatic tracer controls and some with cam actuated tracers.

Conversion Coatings

"Chromate Conversion Coatings" by C. W. Ostrander, Service Manager, Allied Research Products, Inc., Baltimore, Md. This paper describes chromate conversion coatings that have the same passivating characteristics of chromates but go further and deposit an amorphous passivating film on metallic surfaces. The use of these treatments has increased as a result of the growing demand for increased corrosion protection and greater paint adherence than possible with the metal by itself.

"Metal Blasting and Finishing with Airless Blast Equipment" by F. W. Pedrotty, Director of Application Engineering, American Wheelabrator & Equipment Corp., Mishawaka, Indiana. This paper will describe the historical development of dry abrasive blast cleaning and will indicate the uses to

Petersen

Goldring

Gunderson

Ostrander

Pedrotty

Bain

ALFRED H. PETERSON has spent 13 years with Lockheed in the various positions of materials and processes engineer, production methods engineer and production design engineer. A registered professional engineer, he is serving on the Aircraft Research and Testing Committee of the Air-Craft Industries Assoc.

LIONEL S. GOLDRING holds a Ph.D degree in physical chemistry from Massachusetts Institute of Technology and is an author of a number of technical papers. He has been associated with Monsanto Chemical Co., and Brookhaven National Laboratory, and is now working on industrial application of radiation for Nuclear Development Associates, Inc.

A. D. GUNDERSON was the youngest chief tool engineer at George Gorton Machine Co. Now only 34, he has been in charge of designing and building of all special machines, tool and fixtures manufactured by Gorton in the past five years. He was educated at Chicago Technical College.

C. W. OSTRANDER, a member of several technical societies, is also associate curator of minerology for the Natural History Society of Maryland. Author and lecturer, he has held positions with American Smelting and Refining Co., Rheem Manufacturing Co. and is now with Allied Research Products, Inc.

FRANK W. PEDROTTY graduated from the University of Notre Dame with a B.S. degree in architecture. He joined American Wheelabrator & Equipment Corp. in 1926, served in a number of engineering positions, was district sales manager and in 1950 was named to the newly-created position of director of application engineering.

ST. JOHN BAIN attended the University of Virginia and received a B.S. degree in physics at Massachusetts Institute of Technology. Having joined Formica in 1950, he is now engaged exclusively with the development work on the post-forming of laminated plastics, having designed numerous forming dies and bending jigs to be used in the post-forming process.

which this process is currently put. Selection of abrasives for specific cleaning and finishing problems will be discussed.

"Postforming of Thermoset Plastics" by St. John Bain, Project Engineer, The Formica Co., Cincinnati, Ohio. This paper will discuss what constitutes the postforming process and will give a brief history of its development. Details will be given on various methods for heating materials that are to be postformed and methods of forming the heated material, with particular attention to the types of tools and limitations of various grades of laminated plastics.

"Improved Design and Dimensional Control for Investment Castings" by R. L. Wood, President, Arwood Precision Casting Corp., Brooklyn, N. Y. Precision investment castings are limited in their accuracy by two kinds of variables. Some errors are introduced by the natures of the materials used and others are caused by the design of the parts. This paper indicates the various types of variables and describes what should be done to counteract them.

"Manufacturing Applications for Coated Abrasive Belts" by E. E. Oathout, Products Engineer, Behr-Manning Corp., Troy, N. Y. Coated abrasives offer a production tool that can be used in the reconditioning of cutting tools and the finishing of production parts. This paper describes the development of coated abrasives the various types available and the equipment with which they can be used.

Oathout

Alt

E. E. OATHOUT has lectured extensively before chapter and national meetings of several technical societies. Having worked on the development and application of coated abrasives for the past 19 years, he speaks from personal knowledge gained from introducing a great many of the industry's new developments.

ALVIN F. ALT, member of many technical societies in Ohio, has been chief engineer with Planet Products since 1948. A graduate of University of Cincinnati, he was previously associated with Cincinnati Milling Machne Co. as project engneer.

Profile Grinding

"Hydraulically Cammed Profile Grinding" by A. F. Alt, Chief Engineer, Planet Products Corp., Cincinnati, Ohio. This paper indicates the solution to the problem of developing a production type grinding machine for roughing and finishing airfoil sections. This machine operates with progressive line contact grinding—as opposed to plunge grinding with its area contact—and has been applied for grinding concave and convex shapes.

technical papers

"Flame Cutting by Electronic Tracing" by R. F. Helmkamp, Machine Cutting Specialist, Air Reduction Sales Co., New York, New York. This paper discusses the features of the electronic tracer in relation to the rest of the growing field of gas shape-cutting. This is done comparatively, using the magnetic tracer as a basis for comparison. Design aspects of tracing equipment are also outlined.

Industrial Chilling

"Sub-Zero Chilling as An Industrial Process" by R. S. Jamison, Asst. to the President, Sub-Zero Products Co., Cincinnati, Ohio. This paper will briefly cover the history of industrial chilling, the laboratory experiments with it and its emergence as a production process. The main body of this paper will be on specific applications, such as stabilization of alloy steel, chilling of perishable tools to increase their strength and a discussion of chilling as an aid in shrink-fit assembly.

"Ultrasonic Tools for Hard-to-Machine Materials" by J. P. Aloisio, Applications Engineer, Research Division, Raytheon Manufacturing Co., Waltham, Mass. This paper—covering the equipment and procedures for cutting conductive and non-conductive hard materials with ultrasonics and abrasive slurries—has been abstracted and appears on page 77 of this issue.

"Hobbing at High Speeds and Heavy Metal Removal" by J. W. Rapp, Supt. of Gear Manufacturing, Ohio Axle & Gear Division, Rockwell Spring & Axle Co., Newark, Ohio. This paper reports on in-plant tests to determine optimum speeds and feeds for increasing hob life and improving product finish. The use of high-pressure coolants is also discussed.

"Shear-Fracture Parting of Steel Billets" by W. C. Tucker, Chief Engineer, Machine Tool Div., Buffalo Forge Co., Buffalo, N. Y. The author describes the shearing method of billet separation as the fastest way to produce blanks, and indicates the various advantages of this method. Proper machine design and tooling are described so that square ends and accurate blanks can be secured.

"Successful Design of Steel Parts for Cold Extrusion" by D. I. Brown, Market Development Manager, Koldflo Division, Mullins Manufacturing Corp., Salem, Ohio. This paper will describe a plant and facilities for commercial cold extrusion. It will also indicate the possibilities for new products that have been opened up by the cold extrusion process.

"An Orderly Use Classification of Cutting Fluids" by R. G. Moyer, Group Engineer, Research and Development Laboratories, Pure Oil Co., Crystal Lake, Ill. This paper describes methods of, and limitations imposed by, selecting cutting fluids from recommendation charts. Present charts are inadequate, but an intelligent use of the information they contain offers a good starting point.

"What's Known Today About Machining Titanium" by G. T. Fraser, Sales Manager, Rem-Cru Titanium, Inc., Midland, Pa. This paper will include a basic explanation of the physical properties of titanium and the influence they have on machin-

Helmkamp

Jamison

Aloiso

R. F. HELMCAMP, author of numerous technical articles on machine gas cutting, has lectured in colleges from coast to coast and at meetings of several industrial organizations. He has been associated with the Air Reduction Sales Co. for 35 years and has been identified with all of the company's major developments in the machine gas cutting field.

R. S. JAMISON has been active in the low temperature chilling field for the past 12 years. He joined Sub Zero Products Co. in 1943 and is now in charge of development, engineering production and sales.

JOSEPH P. ALOISO is active in furthering applications of ultrasonic and industrial control equipment developed by the research division of Raytheon Manufacturing Co. Before joining the division in 1949, he worked with communication equipment as a development engineer.

JOHN W. RAPP was graduated from the Illinois Institute of Technology with a degree in mechanical engineering. He has been associated with several firms as a gear engineer and is now superintendent of gear manufacturing at Timken's Ohio Axle & Gear Div. plant in Newark, Ohio.

W. C. TUCKER, active in the engineering profession for nearly 35 years, has a series of U. S. and Canadian patents to his credit. He has contributed to various technical publications and formed many close associations with engineering leaders throughout America and Europe.

Brown

Moyer

Fraser

Barnes

Dasey

Stegler

D. I. BROWN, a former editor of IRON AGE, has written hundreds of articles concerning almost every phase of metalworking and lectured before numerous technical organization. He became market development manager for Koldflo Div. of Mullins Mfg. Corp. in June, 1953.

ROBERT G. MOYER, a mechanical engineering graduate of the University of Illinois, joined the Pure Oil Co. early in 1941. A member of various society committees on cutting fluids, this activities also cover work on a variety of industrial and automotive oils and greases.

GEORGE T. FRASER, a member of ASTE since 1938, was graduated from the University of Kansas with a degree in mechanical engineering. Sales engineer with Crucible Steel Co. for 15 years, he joined Rem-Cru Titanium in 1951 as sales manager.

W. A. BARNES joined Utica Drop Forge and Tool Corp. In 1943 as chief engineer and is now vice president in charge of engineering and product development. He has also served as chief engineer for Swartzbaugh Mfg. Co. and for Dominion Electric Mfg. Co.

HOMER H. DASEY was plant manager for Maydole Tool Co., manufacturng analysist for Agfa-Ansco, and administrative engineer for the Harold L. Taylor Co. before organizing his own organization, "Visual" Plant Layouts, Inc., In 1945. A graduate of Chicago Academy of Fine Arts, he spent six years as production manager of LIFE magazine.

RICHARD E. STEGLER has been project engineer on the optical tooling development program for Republic Aviation Corp. since 1950. He has delivered lectures on optical tooling at Republic and conducted demonstrations throughout the industry under the auspices of the Air Materiel Command.

ing and forming this metal. There are as yet no standard procedures established for handling titanium, but the present ideas will be summarized and explained.

Cold Pressure Welding

"Preparation and Tooling for Cold Pressure Welding" by W. A. Barnes, Vice President, Engineering and Production Division, Utica Drop Forge & Tool Corp., Utica, N. Y. In addition to the early history of cold pressure welding, this paper will describe the metals and alloys that can be handled by this process, the types of welds that can be made and the types of tools that are used. An indication of the dependability of cold pressure welding as a process will be given along with examples of present commercial application.

"Visualizing Plant Layout in Three Dimensions" by H. H. Dasey, President, Visual Plant Layouts, Inc., Oakmont, Pa. This paper separates the various components of a plant and shows how to interrelate them and assign correct values to each. Various methods of layout are described and typical uses of three dimension layouts and color coding are included.

"Optical Tooling for Fixture Construction" by R. E. Stegler, Engineer, Manufacturing Research and Development Section, Republic Aviation Corp., Farmingdale, Long Island, New York. This paper will give a brief history of the development of alignment instruments and the methods by which they are used. It will cover the design and construction of fixtures incorporating optical tooling and will indicate how both design and construction of fixtures are more exact and easier. Additional uses of optical tooling are also described.

"New Concepts in Gaging and Inspection" by W. I. Wilt, Assistant Manager, Sales Division, and Harry Keifaber, Gage Application Engineer, Shef-

technical papers

field Corp., Dayton, Ohio. This paper—giving the latest information on air gaging techniques and equipment—has been abstracted and appears on page 73 of this issue.

Powder Metal Parts

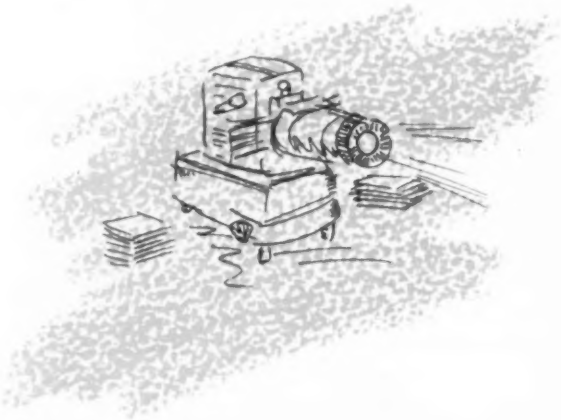
"Product Design for Powdered Metal Parts" by George Stern, Vice President and Technical Director, American Electro Metal Corp., Yonkers, N. Y. By means of charts and tables, a broad summary will be given of various ferrous and nonferrous powder metal materials. Advantages and limitations of metal powder parts, size and shape factors for products to be made of metal powders and subsequent treatment of metal powder parts to obtain proper finish will all be covered.

"Tooling for Powdered Metal Parts" by J. F. Kuzmick, Consultant, Welded Carbide Tool Co., Clifton, N. J. This paper will cover the production aspects of working with powder metal parts. Such properties of powders as compression ratio, punch motions, density distribution and dimensional changes during sintering will be completely discussed.

"Plastic Fixtures Have Wide Use" by Benjamin Sokol, Plastics Engineer, Republic Aviation Corp., Farmingdale, Long Island, New York. This paper —discussing the materials and methods used in the making of plastic tooling—has been abstracted and appears on page 69 of this issue.

"Plastic Dies Move Into Regular Production Service" by G. C. Adams, Staff Engineer, Rezolin Inc., Los Angeles, Calif. The construction and use of plastic dies for various types of forming operations are discussed. In addition to giving complete details on drawing dies; plastic stretch dies, drop hammer dies, laminating molds and post-forming dies are covered.

"Plastic Auto Body Developments" by W. A. Hermonat, Technical Representative, Naugatuck Chemical Division, U. S. Rubber Company, Naugatuck, Conn. The short history of plastic automobile bodies will be covered by this paper with a discussion of the present state of the technique. This paper will indicate the steps that must be taken to increase the use of plastics in automobile produc-



WILLIAM I. WILT has been with Sheffield since 1942 and has served in various sales capacities before becoming advertising manager and assistant director of sales.

GEORGE STERN, vice president and technical director of American Electro Corp., has written many articles and a book on powder metallurgy. He has a master's degree from the University of Michigan and holds many patents, the most significant ones in the field of jet engine compressor blades made by powder metallurgy.

JEROME F. KUZMICK received his M.S. degree in metallurgy from Stevens Institute of Technology where he became an associate professor of metallurgy and was appointed assistant director of the Industrial Powder Metallurgy Laboratory. Now head of his own consulting organization, he holds a number of patents and has lectured widely and written numerous articles for technical societies.

BENJAMIN SOKOL graduated from Yale University with a degree in chemical engineering. Early in 1950 he joined Republic Aviation Corp., starting in the tool design department and going into manufacturing, research and development. He now heads the plastics group.

GEORGE C. ADAMS has been actively engaged in the tooling field since 1923 when he left his mechanical engineering studies at Evansville College. Author of several technical papers on aspects of plastic tooling, he has been associated with Rezolin, Ins., as a staff engineer since 1950.

WILLIAM A. HERMONAT received his B.S. in chemistry from Worcester Polytechnical Institute and after two years in the Navy joined the U. S. Rubber Co. Now with the Naugatuck Chemical Div., he has been working with fabricators of glass polyester automotive parts.

Wilt

Stern

Kuzmick

Sokol

Adams

Hermonat

Bishop

Diebold

Kiefaber

Stewart

Zagar

L. J. BISHOP has had over 25 years' experience in the design, development, manufacture and installation of every conceivable type of material handling device used in a wide variety of industries, including such as automotive, chemical, ceramic, construction, electrical, food, tanning, transportation, textile, rubber and metallurgical.

JOHN DIEBOLD, formerly associated with a leading management consulting firm, is now an independent management consultant who specializes in the application of computers to business operations, both in office and plant, and in new product research. An internationally recognized authority on industrial automation, he has led numerous seminars and conferences.

HARRY KEIFABER has specialized in air gaging and instruments since joining Sheffield in 1940 and is now in charge of engineering and sales activities on gaging cartridges and jet turbine blade gages.

WILLIAM C. STEWART, a graduate of Washington University, has been associated with the Industrial Fasteners Institute as a technical adviser for the past 16 years. A member of several technical organizations, he has been primarily concerned with the research, standardization and the proper use of fasteners.

FRANK ZAGER has been vice president and general manager of Zagar Tool, Inc. since the founding of the corporation in 1949. He has been the main wheel in development work with the company, which now demands the interest of eight members of the Zagar family.

tion and will indicate the role that the tool engineer will play in this new approach.

"Welding and Brazing of High-Temperature Materials" by F. H. Stevenson, Production Engineer, Aerojet-General Corporation, Azusa, California. This paper will discuss the various materials that are generally considered to be in the high temperature class, such as stainless steel Type 347, cobalt alloy, nickel alloys and titanium, and will give welding chracteristics to indicate the merits of the different welding processes. The paper will also cover the tooling required in production of this type.

FRANCIS H. STEVENSON has written for several technical publications and has presented several papers on welding. A former instructor at Burbank Evening School in California, he is now production engineer for the Aerojet-General Corp.

R. C. SINGLETON joined Nelson Stud Welding Div. in 1944 as a field engineer and was named industrial sales manager in 1951. A graduate of the University of California with a degree in physical metallurgy, he has written many articles for engineering publications.

KINGSLEY DRONE has been associated with the metal working industry for the past 15 years. Now chief engineer at Hufford Machine Works, Inc., he began his career as an aircraft mechanical apprentice. Author of numerous technical articles, he has presented a recent series of lectures on the west coast.

Stevenson

Singleton

Drone

Properties of End-Welded Studs

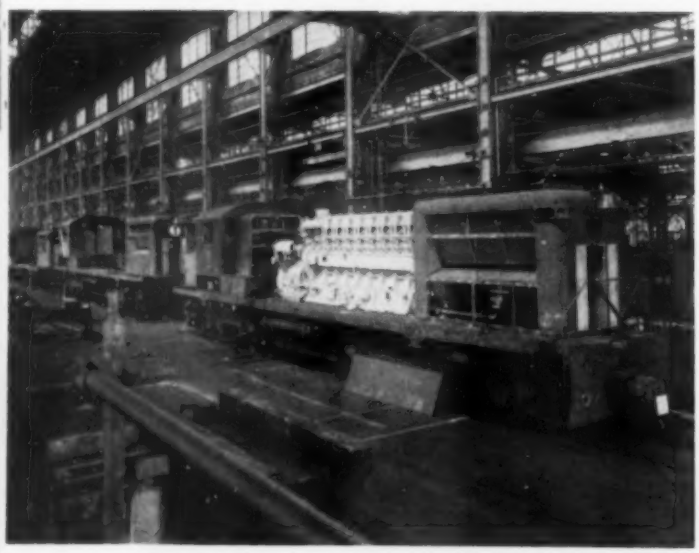
"Ferrous and Nonferrous Stud Welding" by R. C. Singleton, Industrial Sales Manager, Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio. In addition to a brief history of stud welding, this paper will cover the properties of welded studs and the metallurgical aspects of the materials on which they can be used. Procedures for locating studs when using a portable gun and when using a production gun will be completely described along with the auxiliary equipment used for such location.

"Principles of Stretch Wrap Forming" by Kingsley Drone, Chief Engineer, Hufford Machine Works, Inc., El Segundo, Calif. Basic and operating principles of both the rotating-table and rotating-arm types of machines will be described. Various types of part failures will be discussed with methods that should be used to prevent such future failures.

Plant Tours

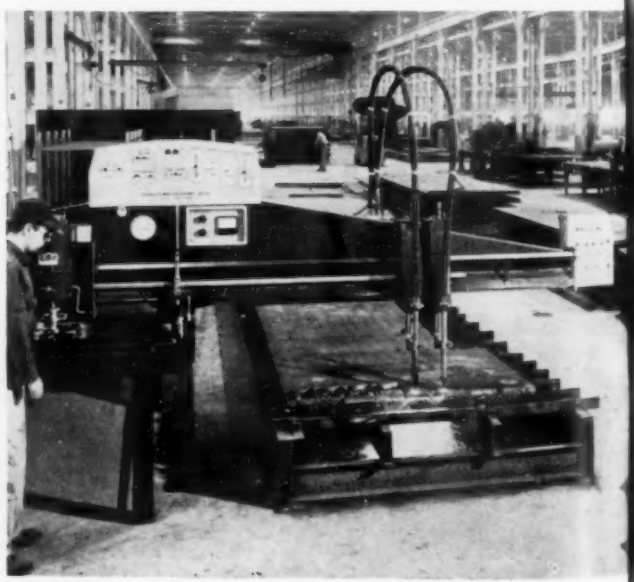
Long an interesting and vital part of ASTE programs, plant tours planned for the 1954 Exposition and Annual Meeting will take ASTE visitors to six well-known manufacturing companies. They are: Baldwin-Lima-Hamilton Corp., The Budd Co.,

The view at the right shows a portion of the machine shop at Yale & Towne Mfg. Co., one of six firms to be visited by ASTE members attending the Industrial Exposition and Annual Meeting on April 26-30.



One of the assembly bays, above, in the diesel locomotive shop at Baldwin-Lima-Hamilton Corp. in Philadelphia shows Baldwin-Westinghouse, 1600-h.p. All-Service locomotives under construction.

Below is pictured a production bay at Link-Belt's new Colmar, Pa., plant where fabrication and assembly of custom-designed conveying and processing machinery are being put on a straightline basis.



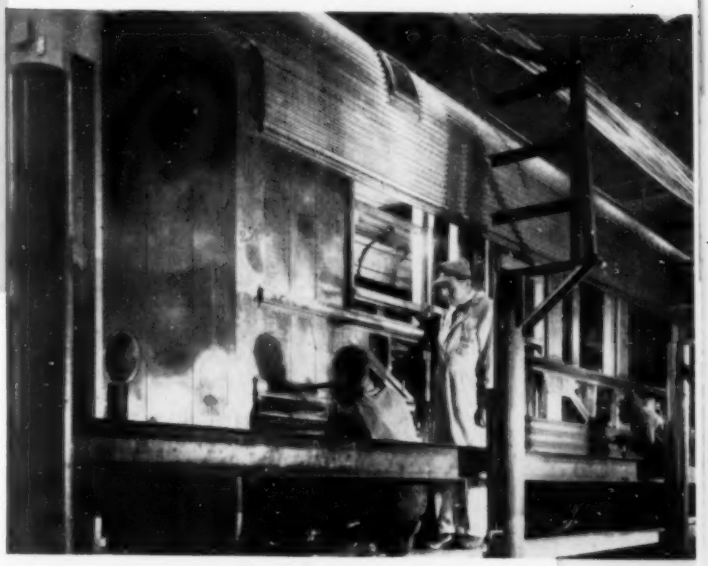
Link-Belt Co., Radio Corp. of America, Fairless Works of United States Steel Corp., and Yale & Towne Mfg. Co.

Tours are scheduled for each day of convention week. Registration headquarters for morning plant visits will be located at the Bellevue-Stratford Hotel where buses will depart at 8:30 a.m. For the afternoon tours, registration will be handled at the Convention Center. Buses will leave at 1:30 p.m.

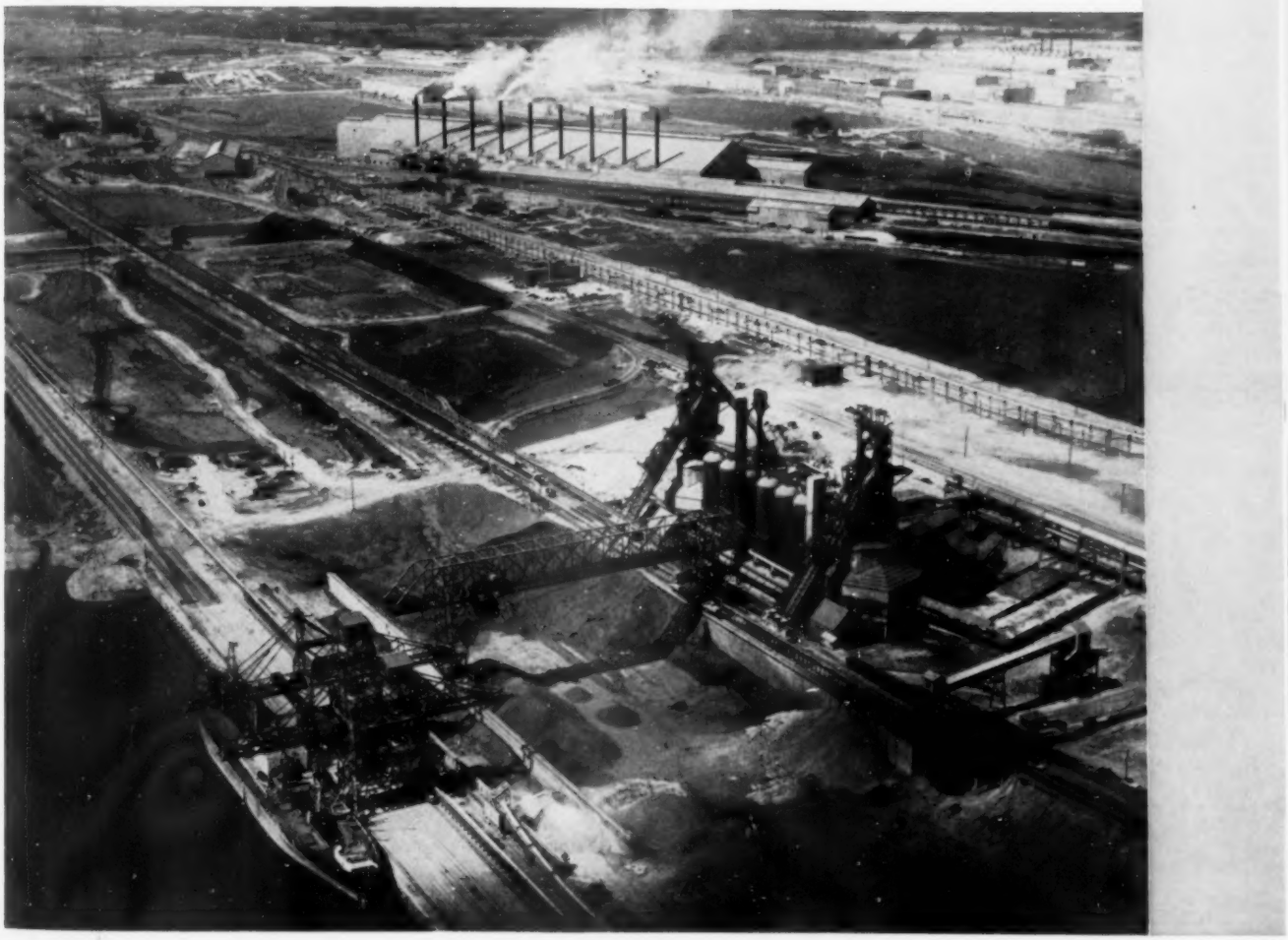
Since the number of visitors for each plant visit (except U. S. Steel) is limited, all members are urged to sign up early.

A special feature on what ASTE visitors will see at Yale & Towne Mfg. Co. is published on page 81 of this issue.

This close-up of a partly completed car at The Budd Co. shows the structural members being covered with fluting. All structural components of Budd cars are stainless steel.



An aerial view of the U. S. Steel's new Fairless Works, located near Morrisville, Pa., shows the ore docks with a ship in unloading position, the ore storage yard and blast furnaces. From left to right at the top of the picture may be seen the coke and coal chemicals area, the blast furnace ladle relining house, the open hearth department with nine furnace stacks and the rolling and sheet and tin finishing facilities.



Plant Management Day

MONDAY APRIL 26

1:30 p.m., Room 300, Convention Center

Problems in Producing Thin-Walled Parts

"Rolled Extrusion of Thin-Walled Parts"—W. N. Parker, Development Engineer, RCA Victor Tube Div., Radio Corp. of America, Lancaster, Pa.

"Rubber-Clamping Assembly of Thin-Walled Parts"—F. R. Simpson, Director of Research and Development, Kuljian Corp., Philadelphia, Pa.

1:30 p.m., Arena Conference Room, Convention Center

What's New and Economical with Surface Cleaning

"Surface Finish Control with Blast Cleaning"—A. P. Neumann, Chief Engineer, Vapor Blast Mfg. Co., Milwaukee, Wis.

"Ultrasonic Techniques in Industrial Cleaning"—Dr. W. L. McCracken, Director of Research, Detrex Corp., Detroit, Mich.

3 p.m., Ballroom, Convention Center

Production Planning and Control (Panel Discussion)

Emil Kitzman, General Superintendent, Colmar Plant, Link-Belt Co., Colmar, Pa.

H. R. Murphy, Planning Department Head, Grumann Aircraft Engineering Corp., Bethpage, Long Island, N. Y.

N. M. Perris, Senior Associate, Stevenson, Jordan & Harrison, Inc., New York, N. Y.

W. L. Tann, Chief Industrial Planning Engineer, Bureau of Ordnance, Navy Department, Washington, D. C.

C. E. Verkler, Assistant Manager of Manufacturing, Caterpillar Tractor Co., Peoria, Ill.

J. R. Weaver, Manager of Manufacturing and Engineering, Westinghouse Electric Corp., Springfield, Mass.

University of Pennsylvania Carbide Seminar

The American Society of Tool Engineers is pleased to cooperate with the University of Pennsylvania by providing its technical assistance in the organization and planning of the university's Carbide Seminar.

Offering the latest and most authoritative information available on carbides Seminar sessions will be held at the University of Pennsylvania School of Mechancial Engineering each day of the ASTE Industrial Exposition and Annual Meeting. Registration for the five-day program, which closed on March 25, was handled by the university.

The only plant scheduled for an ASTE tour on Monday, April 26, is the Baldwin-Lima-Hamilton Corp. Registration for this tour will be handled at the Convention Center where buses will depart at 1:30 p.m.

PROGRAM

8 p.m., Ballroom, Bellevue-Stratford Hotel

Utilizing and Developing Executive Potential

"A Program for Developing Tool Engineers Into Manufacturing Executives"—Dr. R. F. Pearse, Senior Associate, Worthington Associates, Inc., Chicago, Ill.

"Scanlon Employee Relations Plan at Different Production Levels"—E. M. Dowd, Executive Vice President, Lapointe Machine Tool Co., Hudson, Mass.

8 p.m., Burgundy Room, Bellevue-Stratford Hotel

How Research Can Help Predict and Realize Better Machining Performance

"Recent Developments in Analysis of Chip Formation"—Dr. B. W. Shaffer, Project Director, Research Div., College of Engineering, New York University, University Heights, N. Y.

"Turning Research Can Double Production per Labor Hour"—J. C. Hebert, Manager, Machine Tool Div., Jones & Lamson Machine Co., Springfield, Vt.

Mayor Issues Proclamation

The week of April 26th has been officially proclaimed "Tooling for Production Week" in Philadelphia by Mayor Joseph C. Clark, Jr. Mayor Clark issued the following proclamation in recognition of the importance of the 1954 ASTE Industrial Exposition and Annual Meeting.

Whereas, the high standard of living and general prosperity of our nation results from the capacity of our factories to produce goods, and

Whereas, such productive capacity is made possible by the great advancement of tool engineering in the United States, and

Whereas, the American Society of Tool Engineers is comprised of those people who possess the genius in this field of endeavor, and

Whereas, Philadelphia has been chosen by the American Society of Tool Engineers as the place for its 1954 Exposition and Convention from April 26 through 30, and

Whereas, the Society is also sponsoring an extensive series of technical sessions and forums directed to increasing the ability of industry to produce both for defense and home consumption,

Now, Therefore, I, Joseph S. Clark, Jr., Mayor of the City of Philadelphia, do hereby proclaim the week of April 26 through 30, 1954, as "TOOLING FOR PRODUCTION WEEK IN PHILADELPHIA," and request the appropriate observance of this period.

Automation Day

TUESDAY APRIL 27

9 a.m., Arena Conference Room, Convention Center

Quicker and More Automatic Ways of Holding All Work Materials

"Magnetic Holding of Ferrous and Nonferrous Materials"—F. L. Suchanek, Sales Manager, Sundstrand Products Co., Rockford, Ill.

"Jig Design for Multiple Automatic Operations"—F. G. Zagar, Vice President and General Manager, Zagar Tool, Inc., Cleveland, Ohio.

9 a.m., Room 300, Convention Center

Advanced Developments in Induction Heating

"Process Applications for Dual-Frequency Induction Heating"—R. S. Segsworth, Director of Research, General Engineering Co., Ltd., Toronto, Ont., Canada.

"High-Production Tooling for Induction Heating"—P. N. Sorenson, Chief Test Engineer, and C. E. Glick, Production Engineering Manager, Tocco Div., Ohio Crankshaft Co., Cleveland, Ohio.

1:30 p.m., Arena Conference Room, Convention Center

How to Automatize Production with Special Machines

"How to Plan a Transfer Machine"—D. E. Hawkinson, Vice President, Machine Tool Sales, Greenlee Bros. & Co., Rockford, Ill.

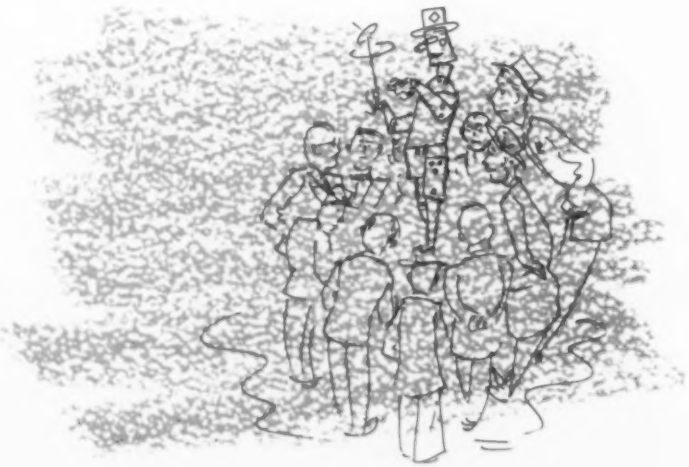
"Creativity in Mechanical Design"—H. A. Oldenkamp, Director of Engineering, and Leo Strauss, Project Manager, General Engineering Laboratories, American Machine & Foundry Co., Greenwich, Conn.

1:30 p.m., Room 300, Convention Center

Best Applications for Mechanical Assembly Techniques

"Changing Trends in Mechanical Fasteners"—W. C. Stewart, Technical Advisor, Industrial Fasteners Institute, Cleveland, Ohio.

"Fastening Techniques for Small Assemblies"—V. L. Bradford, Vice President in Charge of Sales, Milford Rivet & Machine Co., Milford, Conn.



Plants scheduled for ASTE tours on Tuesday, April 27 include: Fairless Works of United States Steel Co., Radio Corp. of America, and Colmar plant of the Link Belt Co.

Registration for the first two plant tours will be handled at the Bellevue-Stratford Hotel where buses will depart at 8:30 a.m. For the afternoon tour of the Link Belt Co., registration will be held at the Convention Center where buses will depart at 1:30 p.m.

PROGRAM

3 p.m., Ballroom, Convention Center

Tooling for Automatics (Panel Discussion)

J. L. Anderson, Chief Tool Estimator, Gisholt Machine Co., Madison, Wis.

J. S. Brozek, Superintendent, Tooling Div., Sargent & Co., New Haven, Conn.

E. L. Ketter, Jacobs Manufacturing Co., West Hartford, Conn.

F. J. McArthur, Chief Tool Engineer, Jones & Lamson Machine Co., Springfield, Vt.

T. H. Olson, Chief Tool Engineer, Yale & Towne Manufacturing Co., Philadelphia, Pa.

John Prohashka, Vice President, Cleveland Automatic Machine Co., Cincinnati, Ohio.

Alfred R. Sparrow, In Charge of Screw Machine Sales, Brown & Sharpe Manufacturing Co., Providence, R. I.

8 p.m., Ballroom, Bellevue-Stratford Hotel

New Techniques and Possibilities for Castings

"The Possibilities for Castings in Airframe Design" —A. H. Petersen, Design Group Engineer, Lockheed Aircraft Corp., Burbank, Calif.

"Automation of Shell Molding"—L. J. Bishop, Vice President and Director of Engineering, Mechanical Handling Systems, Inc., Detroit, Mich.

8 p.m., Burgundy Room, Bellevue-Stratford Hotel

Industrial Penetration of Atomic-Fission Discoveries

"Nucleonics Invade the Tool Engineering Field" —L. S. Goldring, Radiochemist, Nuclear Development Associates, Inc., White Plains, N. Y.

ASTE Center

Everyone is encouraged to use the ASTE Center located in the Center Hall of Convention Center. Here, you can meet friends—receive and leave messages—or just relax in the comfortable lounge. Special desks will be provided for all ASTE Headquarters departments where information on all other chapter services, including THE TOOL ENGINEER magazine, will be available. A general information booth will also be operated by ASTE.

The ASTE Center will offer the perfect opportunity for all chapter officers, committee chairmen and members to get answers to their problems and questions encountered in chapter operation.

Cutting and Grinding Day

WEDNESDAY APRIL 28

9 a.m., Ballroom, Convention Center

Best Approaches to Internal Milling and Jigless Boring

"Tracer-Controlled Pantographic Milling"—A. D. Gunderson, Assistant Chief Engineer, George Gorton Machine Co., Racine, Wis.

"New Arts in Jigless Boring"—C. B. DeVlieg, President, DeVlieg Machine Co., Detroit, Mich.

9 a.m., Room 300, Convention Center

How to Prepare for and Secure Superior Metal Surfaces

"Chromate Conversion Coatings"—C. W. Ostrander, Service Manager, Allied Research Products, Inc., Baltimore, Md.

"Metal Blasting and Finishing with Airless Blast Equipment"—F. W. Pedrotty, Director of Application Engineering, American Wheelabrator & Equipment Corp., Mishawaka, Ind.

9 a.m., Arena Conference Room, Convention Center

"Postforming of Thermoset Plastics"—St. John Bain, Project Engineer, The Formica Co., Cincinnati, Ohio.

"Improved Design and Dimensional Control for Investment Castings"—R. L. Wood, President, Arwood Precision Casting Corp., Brooklyn, N. Y.

1:30 p.m., Arena Conference Room, Convention Center

New Concepts in Abrasive-Belt Grinding

"Manufacturing Applications for Coated Abrasive Belts"—E. E. Oathout, Products Engineer, Behr-Manning Corp., Troy, N. Y.

"Hydraulically Cammed Profile Grinding"—A. F. Alt, Chief Engineer, Planet Products Corp., Cincinnati, Ohio.

1:30 p.m., Room 300, Convention Center

Versatile Manufacturing Uses of Heat and Cold

"Flame Cutting by Electronic Tracing"—R. F. Helmkamp, Machine Cutting Specialist, Air Reduction Sales Co., New York, N. Y.

"Sub-Zero Chilling as an Industrial Process"—R. S. Jamison, Assistant to the President, Sub-Zero Products Co., Cincinnati, Ohio.

Plant scheduled for ASTE tours on Wednesday, April 28, include: Fairless Works of United States Steel Corp., Yale & Towne Mfg. Co., and The Budd Co.

Registration for the first two plant tours will be handled at the Bellevue-Stratford Hotel where buses will depart at 8:30 a.m. For the tour of The Budd Co., registration will take place at the Convention Center where buses will leave at 1:30 p.m.

PROGRAM

3 p.m., Ballroom, Convention Center

High-Speed and Difficult Machining Applications

"Ultrasonic Tools for Hard-to-Machine Materials"—J. P. Aloisio, Applications Engineer, Research Division, Raytheon Manufacturing Co., Waltham, Mass.

"Hobbing at High Speeds and Heavy Metal Removal"—J. W. Rapp, Superintendent of Gear Manufacturing, Ohio Axle & Gear Div., Rockwell Spring & Axle Co., Newark, Ohio.

8 p.m., Burgundy Room, Bellevue-Stratford Hotel

Advantages in Parting and Extruding Cold Steel

"Shear-Fracture Parting of Steel Billets"—W. C. Tucker, Chief Engineer, Machine Tool Div., Buffalo Forge Co., Buffalo, N. Y.

"Successful Design of Steel Parts for Cold Extrusion"—D. I. Brown, Market Development Manager, Koldflo Div., Mullins Manufacturing Corp., Salem, Ohio.

8 p.m., Ballroom, Bellevue-Stratford Hotel

Improved Milling Practices (Panel Discussion)

W. A. Coe, Sales Engineer, Nelco Tool Co., Inc., Manchester, Conn.

Jess Daugherty, Consultant, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Dr. Horace Frommelt, Staff Consultant, Detroit Milling Cutter Co., Detroit, Mich.

K. B. Kaiser, Assistant Chief Engineer, Ingersoll Milling Machine Co., Rockford, Ill.

E. J. Krabacher, Research Engineer, Cincinnati Milling Machine Co., Cincinnati, Ohio.

J. R. Roubik, Assistant Research Engineer, Kearney & Trecker Corp., Milwaukee, Wis.

T. G. Vickers, Master Mechanic, Transmission Div., Clark Equipment Co., Jackson, Mich.

Other Events Scheduled for April 28

8:30 a.m., President's Breakfast for National Delegates, to be followed by the official caucus of the House of Delegates

12 noon, National Delegates' Luncheon

1 p.m., Closed meeting of the House of Delegates

Precision Control Day

THURSDAY APRIL 29

9 a.m., Arena Conference Room, Convention Center

Cutting Fluids and Methods for Machining Difficult Materials

"An Orderly Use Classification of Cutting Fluids"—R. G. Moyer, Group Engineer, Research and Development Laboratories, Pure Oil Co., Crystal Lake, Ill.

"What's Known Today About Machining Titanium"—G. T. Fraser, Sales Manager, Rem-Cru Titanium, Inc., Midland, Pa.

9 a.m., Ballroom, Convention Center

Parts Design for Cold Pressure Welding

"Preparation and Tooling for Cold Pressure Welding"—W. A. Barnes, Vice President, Engineering and Production Div., Utica Drop Forge & Tool Corp., Utica, N. Y.

10 a.m., Ballroom, Convention Center

Extending Industrial Plant Layout to Take on Depth

"Visualizing Plant Layout in Three Dimensions"—H. H. Dasey, President, Visual Plant Layouts, Inc., Oakmont, Pa.

1:30 p.m., Arena Conference Room, Convention Center

How Integrated Automation Can Revolutionize Production Patterns

"The Challenge of Automation"—John Diebold, Management Consultant, Weehawken, N. J.

1:30 p.m., Ballroom, Convention Center

Latest Fixture Assembly and Inspection Tools

"Optical Tooling for Fixture Construction"—R. E. Stegler, Engineer, Manufacturing Research and Development Section, Republic Aviation Corp., Farmingdale, Long Island, N. Y.

"New Concepts of Gaging and Inspection"—W. I. Wilt, Assistant Manager, Sales Div., and Harry Kiefaber, Gage Application Engineer, Sheffield Corp., Dayton, Ohio.

Other Events Scheduled for April 29

9 a.m., Board of Directors' Meeting

6:15 p.m., President's Reception for National Officers, Directors, National Committee Chairmen and Past Presidents

Plants scheduled for ASTE tours on Thursday, April 29, are the Link Belt Co. and Yale & Towne Mfg. Co.

Registration for the Link Belt tour will be handled at the Bellevue-Stratford Hotel where buses will depart at 8:30 a.m. For the Yale & Towne tour, registration will take place at the Convention Center where buses will leave at 1:30 p.m.

PROGRAM

3 p.m., Ballroom, Convention Center

Inspection Ways and Means (Panel Discussion)

P. G. Fishback, Manufacturing Engineer, Accessories Div., Thompson Products, Inc., Cleveland, Ohio.

Joseph Manuele, Director of Headquarters Quality Control, Westinghouse Electric Corp., Pittsburgh, Pa.

Franklin Meyer, Jr., Chief Engineer, Instrument Gage Div., Taft-Peirce Manufacturing Co., Woonsocket, R. I.

F. B. Murphy, Field Manager, Johnson Gage Co., Bloomfield, Conn.

S. D. Nicolas, Chief Inspector, Merz Engineering Co., Indianapolis, Ind.

E. C. Polidor, Vice President and Director of Research, Optical Gaging Products, Inc., Rochester, N. Y.

G. H. Stimson, Gage Sales Manager, Greenfield Tap and Die Corp., Greenfield, Mass.

7 p.m., Ballroom, Bellevue-Stratford Hotel

22nd Annual Banquet of the American Society of Tool Engineers

"Pattern for Progress"—Dr. Henry T. Heald, Chancellor, New York University, University Heights, N. Y.

Dr. Henry T. Heald Will Address 22nd Annual Banquet of ASTE

Well-known e d u c a t o r, administrator, business executive, engineer, and civic leader, Dr. Henry T. Heald, chancellor of New York University, will address the 22nd Annual Banquet audience at the Bellevue-Stratford Hotel. His subject will be "Pattern for Progress."

Now head of America's largest university, Dr. Heald has served as president of Armour Institute of Technology and Illinois Institute of Technology in Chicago. He has been president of the Society for Engineering Education and the Western Society of Engineers, and vice chairman of the Educational Council for Professional Development.

Recipient of numerous national awards in engineering and education, Dr. Heald is also active in business. He is a director of American Steel Foundries, Equitable Life Assurance Society of the U. S., Research Corporation of New York, Stewart-Warner Corp., and Swift & Co.

Forming and Assembling Day

FRIDAY APRIL 30

9 a.m., Room 300, Convention Center

What the Tool Engineer Needs to Know About Powder Metallurgy

"Product Design for Powdered Metal Parts"—George Stern, Vice President and Technical Director, American Electro Metal Corp., Yonkers, N. Y.

"Tooling for Powdered Metal Parts"—J. F. Kuzmick, President, Welded Carbide Tool Co., Clifton, N. J.

9 a.m., Arena Conference Room, Convention Center

How Plastics Are Moving Into Full-Scale Production

"Plastic Fixtures Have Wide Use"—Benjamin Sokol, Plastics Engineer, Republic Aviation Corp., Farmingdale, Long Island, N. Y.

"Plastic Dies Move Into Regular Production Service"—G. C. Adams, Staff Engineer, Rezolin, Inc., Los Angeles, Calif.

"Plastic Auto Body Developments"—W. A. Hermonat, Technical Representative, Naugatuck Chemical Div., U. S. Rubber Co., Naugatuck, Conn.

1:30 p.m., Room 300, Convention Center

Newest Approaches to Welding Problems

"Welding and Brazing of High-Temperature Materials"—F. H. Stevenson, Production Engineer, Aerojet-General Corp., Azusa, Calif.

"Ferrous and Nonferrous Stud Welding"—R. C. Singleton, Industrial Sales Manager, Nelson Stud Welding Div., Gregory Industries, Inc., Lorain, Ohio.

1:30 p.m., Arena Conference Room, Convention Center

Latest Techniques in the Forming of Sheet Metals

"Principles of Stretch Wrap Forming"—Kingsley Drone, Chief Engineer, Hufford Machine Works, Inc., El Segundo, Calif.

"Planned Pre-Deforming of Shapes for Better Drawing"—C. M. Geddis, Assistant Master Mechanic, Buick Motor Div., General Motors Corp., Flint, Mich.

Plants scheduled for ASTE tours on Friday, April 30, are the Radio Corp. of America and Baldwin-Lima-Hamilton Corp. Registration for both tours will be handled at the Bellevue-Stratford Hotel where buses will depart at 8:30 a.m.

Other Events Scheduled for April 30

9 a.m. Past Presidents' Meeting
12 noon, Past Presidents' Luncheon

PROGRAM

3 p.m., Ballroom, Convention Center

Workholding Ways and Means (Panel Discussion)

J. L. Balciunas, Chief Engineer, Skinner Chuck Co., New Britain, Conn.

L. R. Burger, Sales Manager, Logansport Machine Co., Inc., Logansport, Ind.

Ken Cole, Chief Designer, N. A. Woodworth Co., Detroit, Mich.

J. I. Karash, Production Manager, Reliance Electric & Engineering Co., Cleveland, Ohio.

Philip Lindhuber, Chief Tool Designer, Spicer Manufacturing Div., Dana Corp., Toledo, Ohio.

R. W. Newton, Tool Analyzer, International Business Machines Corp., Poughkeepsie, N. Y.

J. E. Rotchford, Vice President, Lodding, Inc., Worcester, Mass.

Regional Educators' Conference

Engineering education offered by schools, colleges and universities across the nation will be evaluated at the Atlantic Seaboard Regional Educators' Conference to be held April 30 at the Ben Franklin Hotel. Conducted by the ASTE National Education Committee, the Conference is expected to draw nearly 50 leading educators for the luncheon and afternoon panel discussion.

Panel moderator will be Dr. Carl C. Chambers. Vice President in Charge of Engineering Affairs, University of Pennsylvania, Philadelphia.

Other participants and their subjects are: "Engineering Fundamentals" by Harold A. Bolz, Head of the Department of General Engineering, Purdue University, Lafayette, Ind.

"Broadening Our Engineering Education" by Gordon B. Carson, Dean of the College of Engineering, Ohio State University, Columbus.

"The Need for Tool Production Engineering Training" by O. W. Boston, Chairman of the Department of Production Engineering, University of Michigan, Ann Arbor.

"Industry's Evaluation of Engineering Education" by Guy Klies, Manager of the Central Technical Departments, Westinghouse Electric Corp.

Chambers

Bolz

Carson

Boston

Klein

Your Guide to Philadelphia

By Edith R. Saunders

Highly rewarding leisure hours are in store for ASTE visitors to Philadelphia who enjoy sightseeing—for what other city can claim a more famous background of Colonial and Revolutionary history?

Birthplace of the nation and "Cradle of Liberty," Philadelphia provides ample opportunity to see some of the hallowed national shrines and reknown historical landmarks. What's more, you can capture the country's early beginnings in one short walk.

Starting at Independence Square, you'll see Independence Hall, home of the most cherished of national relics, the now-silent Liberty Bell. The same desks and chairs used by the Continental Congress are arranged just as they were when the Declaration of Independence was signed in 1776.

The renowned Philadelphia Art Museum sits on a bluff overlooking the Schuylkill River.

Close by are Congress Hall, where George Washington took the oath of office for his second term and also delivered his famed farewell address, and Old City Hall, where the first Supreme Court of the United States met in 1791.

The only private building in Independence Square was designed by Benjamin Franklin for the American Philosophical Society. The versatile Franklin is also responsible for the quaint charm of the four-sided gas lamps which illuminate the square at night.

Across the street is an old columned building which for many years was the U. S. Custom House. Built in 1819, it was originally the home of the Second United State Bank.

Carpenter's Hall, first meeting place of the Continental Congress, is a block or two from Independence Square. It was originally built for a guild of master carpenters. You'll also find the oldest bank building in America in this neighborhood. It was erected in 1795 by the First Bank of the United States.

Revolutionary figures including Washington, Adams, and Lafayette worshipped a few blocks away at Christ Church which dates back to 1727. The prayer book from which King George's name was erased in 1776 is still on display.

Around the corner is the home of Betsy Ross, credited with stitching together the first American flag. A replica of the original 13-star banner which flies from the top window will help you spot this landmark. The graves of Benjamin Franklin and his wife, Deborah, and six other signers of the Declaration of Independence are in the Christ Church cemetery down the street. Passersby often throw pennies on the tombstone of Franklin in affectionate tribute to the memory of the thrifty and frugal inventor-statesman.

Franklin Institute, one of the foremost of its kind, houses many scientific and historical exhibits.

This ends your capsule tour on foot, but by no means exhausts Philadelphia's list of outstanding sightseeing "musts."

To more fully capture the atmosphere of early Philadelphia, you shouldn't miss the worn cobblestone street of Elfreth's Alley, an entire block of early period houses preserved since the time of William Penn's "Greene Countrie Towne."

Americans who have long loved the tales and lyrical poems of Edgar Allen Poe, will want to visit his home which has been preserved as it was when he wrote "The Raven."

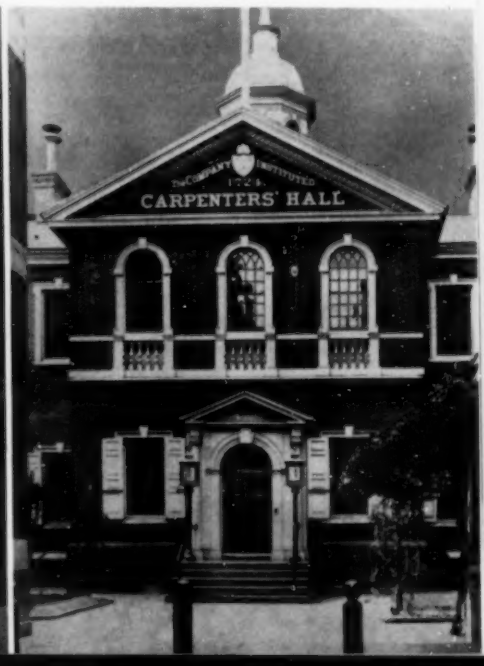
Gloria Dei, or as it is more widely known, Old Swede's Church, was erected in 1700 by Swedish colonists and is the oldest church in Philadelphia. The first and largest of the U. S. Mints is also located in Philadelphia.

Continued on next page

The Old Custom House was the first home of the Second United States Bank.

The Betsy Ross House where the well-known seamstress stitched together the first American flag for General Washington.

Carpenter's Hall was the first meeting place of the Continental Congress.



Independence Hall, one of the most famous of Philadelphia's landmarks and home of the Liberty Bell.

Connie Mack Stadium where the American League Athletics and the National League Phillies will be playing baseball during the Industrial Exposition.

Continued from preceding page

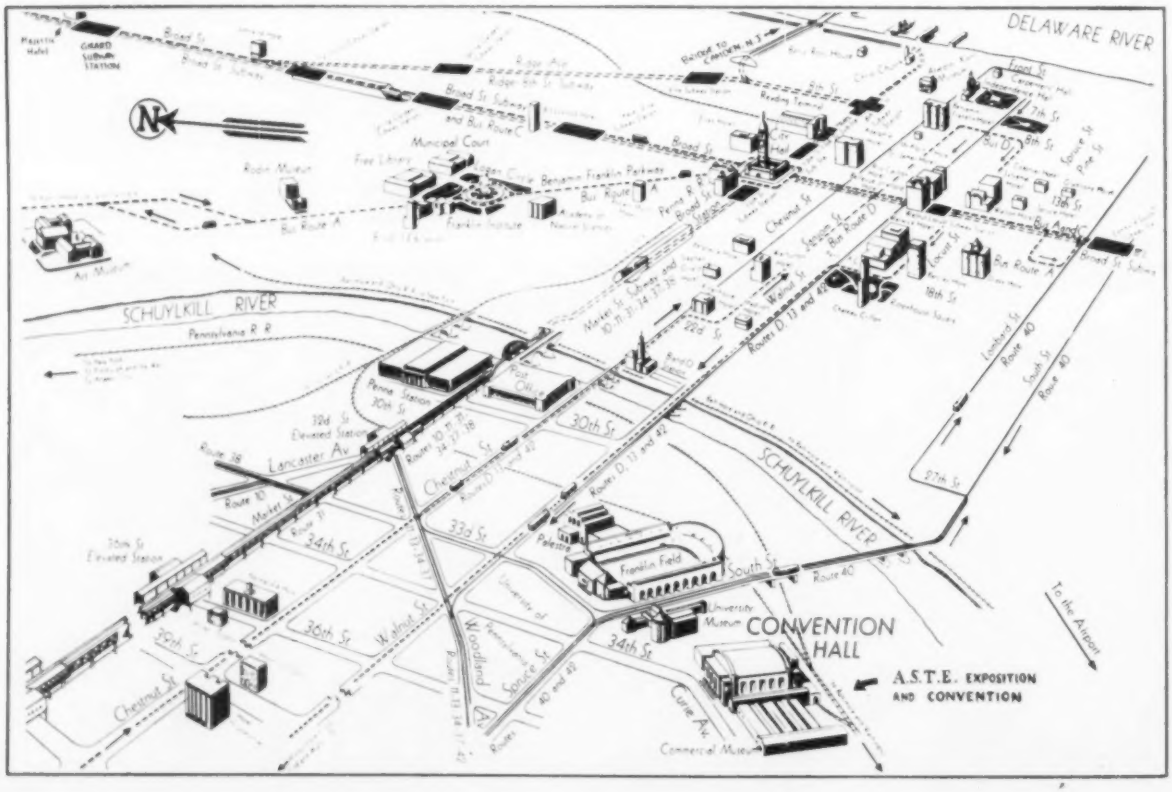
Daily tours reveal the coining process of the change that may jingle from time to time in your pocket.

Philadelphia is a great cultural center abounding in scientific, historical and art museums. Foremost among these perhaps is Franklin Institute, home of Fels Planetarium, a museum of scientific and historical exhibits, and the Benjamin Franklin Memorial.

Many of Franklin's personal belongings such as his bifocals, almanac and typesetter's stick are displayed here. Of recent national interest is the "Engine of Life," biggest heart in the world. The model is large enough to walk through and you can follow a pathway identical to that of the blood in normal cardiac circulation. An imaginary trip to the moon can be yours if you visit the Fels Planetarium where trained specialists are on hand to give demonstrations on the movements of celestial bodies.

The Philadelphia Art Museum, ranked with the finest in the world, boasts a priceless collection of medieval, Rennaisance, Oriental, and contemporary art. Close by is the Aquarium where more than 3,000 specimens of marine life swim before the public eye.

The Aquarium and Art Museum are at the entrance to Fairmount Park, the world's largest natural park within a city limits. Containing many points of historic interest, it covers 3,500 acres and extends for miles along both banks of the Schuylkill.



'round the town

Eating

Arthur's Steak House—3rd below Walnut—Philadelphia's oldest steak house featuring food for epicurean tastes.

Louis G. Baurele, Inc.—14 S. 15th—Specializes in snapper soup and cheese cake.

Black Horse Tavern—City Ave.—Steaks, Lobster Thermidor and Crabmeat Imperial.

Bookbinder's Old Original Restaurant—125 Walnut—Famous for sea food and lobsters since 1865. Quaint old setting.

Chanticleer Bamboo Room—263 S. 15th—Piquant hors d'oeuvres, prime steaks and salad cuisine in an intimate musical background.

Chinaland Restaurant—932 Race—Chinese-American food. Boasts best egg-roll in Chinatown.

Kelly's on Mole St.—Sea foods, steaks and chops for over a half century. Features an oyster and clam bar.

Maurice's—211 S. Quince—Prime steaks and chops served in old-world atmosphere.

Original Snockey's Sea Food House—538 S. Eighth—Menu features jumbo shrimps and crabs and Maine lobster.

Schoellhammer's—Hancock and Girard—German-American specialties including Wienerschnitzel and Sauerbraten.

Shoyer's—412 Arch—Home-cooked food specializing in sea delicacies.

Tille's Restaurant—1528 Chestnut—Old English atmosphere and excellent variety of food on menu.

Victor Cafe—1303 Dickenson—Delicious Italian specialties served in continental atmosphere, fine music.

Side trips

Longwood Gardens—two miles north of Kennett Square, Pa. on U.S. 1—beautiful estate of the du Pont's. Open daily 11-5 no charge, Sundays 50c.

Valley Forge Memorial Park—24 miles northwest of Philadelphia—General Washington's Headquarters, and acres of dogwood trees.

Browsing

Aquarium—West of Art Museum on east bank of Schuylkill—More than 3,000 marine specimens. Open daily 9-4:30, Sun. 9-5. Free admission.

Atwater Kent Museum—15 S. Seventh—Permanent exhibits which tell the 300-year history and progress of Philadelphia. Open daily 9-5. Sun. 2-5. Free.

Commercial Museum—9414 Meadowbrook—Exhibit of raw materials and manufactured products of many countries. Open daily 9-5, Sun. 2-5. Free.

Drexel Institute Art Gallery—32nd and Chestnut—Paintings of 19th century German and French Barbizon school artists. Open daily, except Thursdays, 9-5:30, Sat. to noon. Free.

Franklin Institute—20th and Parkway—Historical and scientific exhibits. Open daily 12-5, Sat. 10-5, closed Mon. Admission 60c includes planetarium.

Fels Planetarium—20th and Parkway—Housed in Franklin Institute demonstrations and lectures given daily except Mondays at 3 p.m. Wednesday, Friday, and Saturday at 8:30 p.m. Admission 60c includes institute.

Free Library—19th and Parkway—A pleasant roof-garden reading room for warm weather reading. Open daily 9-10, Sun. 2-6.

Free Natural History Museum—19th and Parkway—Habitat of groups of animals and birds, exhibits of minerals, shells, and fossils. Open daily 9-5, Sun. 1-5. Free.

Pennsylvania Academy of Fine Arts—Broad and Cherry—American art from early Revolutionary portraiture through contemporary. Open daily, except Monday, 10-5, Sundays 1-5.

Philadelphia Museum of Art—Parkway and 25th—One of the finest collections of medieval, Renaissance, modern and oriental art. Open daily and Sunday 9:30-5. Free.

Rodin Museum—22nd at Parkway—Has the famous Mastbaum collection of Rodin sculpture, drawings, and water colors. Open daily and Sunday 9:30-5. Free.

University of Pennsylvania Museum—33rd and Spruce—Ethnological and archaeological exhibits of other civilizations. Open daily 10-5, Sunday 1-5. Free.

Chapel of Four Chaplains

located on Broad and Berks Streets, invites you to the April 25 Sunday vesper service from 4-5 p.m. The renowned chapel was dedicated to the memory of the four chaplains, all of different faiths, who gave up their life belts and lives that others might live when the Dorchester was torpedoed off the coast of Greenland February 3, 1943.

K. W. Riddle
Chairman, National
Program Committee

Edmund Hollingsworth
Host Committee
General Chairman

E. H. Wheeler
Host Committee
Vice Chairman

H. W. Gross
Host Committee
Secretary

R. A. Lowry
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Social Programs

Robert Mason
Banquet

John Moorhouse
Luncheons

Walter Phifer
Entertainment

Edward Rauss
Reception

Mrs. Emil Kitzman
Ladies' Activities

Campbell Pittsinger
Technical Chairman

Philadelphia Chapter

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William Pinkstone
Technical Sessions

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Functions

J. H. Locke, Jr.
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P. B. Mochel
Signs

C. C. Brogan, Jr.
Session Arrangements

H. A. Andresen
Housing

Fred Hertrick
Registration

A. B. Taylor, Jr.
Publicity

Karl Rauch
Records and Reports

D. C. Taylor
Emergency

Ladies' activities

Washington's Headquarters, in Valley Forge Memorial Park, main point of interest on Thursday's tour.

ASTE wives attending the Exposition in Philadelphia have a wide range of activities to choose from while their engineering-minded husbands attend the Industrial Exposition or sit in on lectures and business conferences.

Instead of dividing their time between the not-so-homey atmosphere of a hotel room and wandering timidly around a strange city, they can participate in informal sight seeing tours, window shopping or jaunts to the museums.

An exposition committee headed by Mrs. Emil Kitzman has been working for months to make the week an enjoyable one for ASTE wives.

A special program includes a TV studio tour, including seats for two audience participation shows, and journeys to Longwood Gardens, renowned du Pont estate in Wilmington, Delaware, and historic Valley Forge Memorial Park.

"The Pink Room" of the Bellevue-Stratford Hotel has been reserved as a "hospitality room" and will serve as informal headquarters for meeting friends, playing cards and just plain relaxing.

Tuesday at 10 a. m. buses will carry the ASTE wives from the Bellevue-Stratford Hotel to scenic Longwood Gardens. Vanity must be cast aside in favor of comfortable walking shoes for this particular trip. The grounds include natural woodlands, greenhouses, formal landscaped gardens and famous fountains. Luncheon at Christie's is also scheduled.

On Wednesday stations WFIL-TV and WCAU-TV will throw open their doors for a behind-the-scenes ASTE tour. Tickets will include "Cinderella Week End" with Quizmaster Alan Scott and "Stop, Look and Listen" hosted by Tom Moorehead. Buses will leave from the same spot at 11 a. m.

Because the number who can take this tour is limited, pre-reservation blanks and remittance of $1.75 for bus fare and luncheon must be in Mrs. Kitzman's hands by April 12. Her address is 103 Shippen Road, Philadelphia 18, Pa.

Buses will depart at 10 a. m. Thursday for the 24-mile trip to Valley Forge Memorial Park, where General Washington and his troops camped during the severe winter of 1777-78. Acres and acres of dogwood trees will almost deny the possibility that such a bitter season ever visited this spot.

The women will be whisked back to the hotel in plenty of time to join their husbands for the 22nd Annual Banquet to be held in the Bellevue-Stratford Ballroom that night. Attire for the affair is not formal.

Longwood Gardens, du Pont Estate in Wilmington, Delaware, offers beautiful grounds to explore.

Each day of the Exposition, these top-level Conferences* on New Industrial Developments will be held right in the Convention Center . . .

APRIL 26
MONDAY
Plant Management Conferences

APRIL 27
TUESDAY
Automation Conferences

APRIL 28
WEDNESDAY
Cutting & Grinding Conferences

APRIL 29
THURSDAY
Precision Control Conferences

APRIL 30
FRIDAY
Forming & Assembling Conferences

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Your 5 MOST IMPORTANT *Days* IN 1954

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- *The* major industrial exposition of production equipment and manufacturing processes.
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Plan now to attend . . . and to have your key men attend with you

For more complete details on the 1954 ASTE Industrial Exposition, write on your company letterhead for the "ASTE show plan booklet." It will be mailed to you promptly, free of charge.

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10700 PURITAN AVENUE DETROIT 38, MICHIGAN

news

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About 150 Windsor members heard an informative talk by Matthew A. Cavanaugh, center, assistant works manager for the Budd Co., Philadelphia, at the February meeting held at the Prince Edward Hotel. Pictured with the speaker are George Cambridge, purchasing agent for Ford of Canada, Ltd., and John F. Johnson, chapter chairman. In his talk, the Budd executive traced the part played by the engineer in the body die and stamping for automobiles.—*Ernest W. Harris*

Additional Candidates Nominated for Election to Board of Directors

The following men have been legally nominated by petition and should be considered along with those named in the recent report of the Annual Nominating Committee as qualified candidates for election to the ASTE Board of Directors.

Lawrence H. Cook, area captain for the National Membership Committee and chapter delegate for the Santa Clara Valley chapter in 1953, is sole owner of Cook Research Laboratories, a tool and die contract manufacturing business located in Menlo Park, Calif. In business for himself the past 25 years, Mr. Cook also taught engineering at the University of Santa Clara from 1927 until 1936. He holds degrees in chemistry and mechanical engineering from Stanford University and completed work at Santa Clara University for his Ph.D. in chemistry. A registered professional engineer in California and Nevada, Mr. Cook is a member of several other technical societies and is now serving as president of the Sewage and Water Association for the State of California. Active in civic affairs, he is also a member of the Governor's Advisory Board of Civil Defense.

Richard B. Niebusch, past chairman and 1954 national delegate of the Cincinnati chapter, is divisional manager of tooling at Cincinnati Milling Machine Co. He joined the firm 26 years ago as assistant to the chief tool designer. Mr. Niebusch has served in all but one of Cincinnati chapter's elected offices and has headed several committees. A graduate of Ohio Mechanics Institute, he attended night classes for eleven years at the University of Cincinnati. He is a member of the Engineering Society of Cincinnati and is active in civic organizations.

Cook

Niebusch

Henry Tesmer Heads Mid-Hudson Officers

Mid-Hudson chapter members met February 9 to select their 1954-55 slate of officers. Heading ASTE activities this coming year will be: chairman—Henry J. Tesmer; first vice chairman—Richard Fitzgibbons; second vice chairman—Frank N. Plotnik; secretary—William F. Shopmyer; treasurer—J. Harry Keller; national delegate—Stanley P. Cook; alternate delegate—Henry Tesmer. —*Harold J. DePew*

Fairfield County Elects ASTE Officers

Bridgeport, Conn.—Sixty members of the Fairfield County chapter turned out February 3 to elect ASTE officers for 1954-55. Named to office were chairman—Philip Marsilius; first vice chairman—Edgar Mayberry; second vice chairman—Eugene Laistner; secretary—Carl Horvath; treasurer—Frank Moriarty; national delegate—Richard W. Smith; alternate delegate—Eugene Laistner.

Total membership in the chapter has hit the 247 mark, according to an announcement made by Membership Chairman Ed Mayberry who reported that 20 new members had joined just since the previous meeting.

Movies showing standard and unusual applications of the Denison Multipress illustrated a talk made by Francis Springer, district manager.

—*Vernon L. Wade*

Salt Lake Chapter Elects Harry Todd

Salt Lake City—Results of the ASTE election of officers held February 12 show the following Salt Lake City members guiding 1954-55 activities: chairman—Harry Todd; first vice chairman—Bill Bullough; second vice chairman—Merrill Shaw; secretary—Joe Oviatt; treasurer—Reid L. Rice; national delegate—Jack Woodhead; alternate—Harry Todd; and delegate to Utah Engineering Council—Frederick Preator.

Along technical lines, the evening's program turned to Leslie Seager, chief production engineer at Eimco Corp. for a talk on drill design. —*Reid L. Rice*

Jeffries Elected Peterborough Chairman

Peterborough, Ont.—Election of new officers and a technical program on the modern method of hole punching was on the agenda for 55 Peterborough members who attended the February meeting. In charge of ASTE activities for 1954-55 are: chairman—Albert L. Jeffries; first vice chairman—Bruce G. MacKenzie; second vice chairman—Hugh Heslip; third vice chairman—Fred H. Mason; secretary—George Jeffery; and treasurer—Ralph Sanderson.

Technical speaker was John C. Kosky, public relations director of Wales-Strippit Corp., North Tonawanda, N. Y. —*F. H. Mason*

ciety Voting Membership Approves Amendments to ASTE Constitution

amendments to the ASTE Constitution have been approved on a referendum ballot by the voting membership according to an announcement by Raymond C. W. Peterson, national secretary of the Society. A very gratifying response of returns approved all the amendments by an overwhelming majority.

The changes involved an enlarged membership of the Board of Directors; an additional requirement to become president; new procedure for electing the president in case of office vacancy; provisions for protecting the nonprofit character of the Society; altered requirements for amending the Constitution; restatement of the Research Fund's geographic scope; and further clarifications of qualifications for senior, affiliate and associate memberships in the Society.

Increased Board

The number of members who will serve on the Board of Directors has been changed from eleven to fifteen, fourteen of whom will be elected by the House of Delegates at the annual meeting. The increase was considered necessary by many to provide more adequate representation and carry on the wide chapter visitation program. The tremendous growth in numbers of chapters and overall membership was responsible for the proposal.

With fifteen members on the Board, it will take an affirmative vote of not less than eleven to alter or amend the By-Laws. This, of course, excepts changes affecting qualifications, classifications, term of office and number of directors which are covered in the Constitution.

Election of President

Another approved amendment states that in order to be elected President of the Society, the candidate must be a director whose term of office does not expire during that term of office as President. This was deemed necessary in order to be in strict conformity with the corporate laws under which the Society was chartered.

Also pertaining to the presidential office, it was approved that in the case of vacancy in that office, the Board of Directors will elect a president from their own number to serve the unexpired term. This eliminates the former practice whereby the vice president automatically became president and was not in strict accordance with the corporate laws.

Another item among the changes requires that any member desiring to propose an amendment to the Constitution, may do so by securing the signatures on a petition of one per cent of the membership eligible to vote, but not less than 150. This was proposed in consideration of the cost of processing referendums because of the vast growth in Society membership.

In order to preserve the Society's nonprofit, tax-exempt position, a constitutional change has been approved providing for the event of the Society's discontinuance. It states that all monies on hand will be donated to scientific and/or educational institutions as may be designated by the voting membership through their House of Delegates.

The clause in the Constitution which created the Research Fund has been reworded. Its purpose was originally stated as that of "conducting research for the advancement of scientific knowledge in the field of tool engineering in the United States". The words "United States" have been deleted, since the benefit of such research was meant to accrue to the benefit of the field of tool engineering wherever located.

Membership Qualifications

Three other amendments pertain to a clearer statement of qualifications for senior, affiliate and associate membership in the Society. Senior membership requirements have become more stringent by the changing of one word. *And* is substituted for *or* and the Constitution now reads "A person who has acquired a tool engineering background through five years of actual contact, and is qualified to recommend correct tools *and* equipment for manufacturing processes".

Another word change re-defines qualifications of an affiliate member to include educational institutions or universities.

In like manner, the definition of an associate member has been altered to more aptly set forth positive meaning to the requirements and eliminate the alternative which might admit unqualified associate members to the Society.

Col. Fletcher

Ordnance Expert Named Research Fund Director

Appointment of Colonel Leslie S. Fletcher to the position of research fund director, American Society of Tool Engineers, has been announced by R. B. Douglas, chairman of the Society's Research Fund Committee and a past president of ASTE.

Col. Fletcher is a graduate of West Point Military Academy, and also has attended Rhode Island State College and Massachusetts Institute of Technology. He holds a B. S. degree in mechanical engineering.

United States Army Ordnance Department assigned him to various ordnance depots. At Rock Island Arsenal, he developed continuous manufacture of metallic machine gun links, tank track parts, and stainless iron recoil cylinders. Later, at Frankfort Aresnal, he was officer in charge of mechanical time fuse design and production.

Immediately prior to World War II he was officer in charge of Pittman-Dunn Laboratory. Holder of three decorations for administrative work, he took part in the Salerno and Normandy landings during World War II.

Prior to joining the American Society of Tool Engineers as research fund director, Col. Fletcher was technical director and president of Sam Tour & Company, Inc.

He is past chapter chairman of the Tri-Cities chapter and is now member of the executive committee of the New York chapter of American Society for Metals. He is a registered professional engineer in New York State and is a member of the American Society of Mechanical Engineers, American Society of Tool Engineers, American Society for Testing Materials, A.O.A., and Metal Science Club of New York.

Stanley Klamka, left, service engineer, Reed Rolled Thread Die Co., Worchester, Mass., addressed 70 Springfield, Ill. members at a recent meeting. Shown with him are Paul Dirkson, program chairman, and N. L. Solie. Another feature of the meeting was the awarding of a prize for Donald Flynn for his outstanding work in the recent membership drive. This photograph was taken by E. T. Kane. Report by Charles Collier.

Atomic Energy Discussed by Portland Speaker

Portland, Me.—New officers of the Portland ASTE chapter, elected at the February 12 meeting, include: chairman—Harold Chaplin; first vice chairman—Ross L. Beaubien; second vice chairman—James A. Comeau; secretary—Howard W. Stevens; and treasurer—Frank Thomas.

The technical program was presented by Charles Victor Moore, Knolls Atomic Power Laboratory, General Electric Co., Schenectady, N. Y. With the aid of films, he discussed how nuclear fission produces energy in a nuclear reactor, how this energy is utilized in various ways in different types of reactors and what the prospects seem to be for constructive uses of atomic energy.

—Henry C. Hagman

Buffalo Company Names New Vice President

Frederick E. Munschauer, Jr. has been elected to the new office of vice president in charge of manufacturing and industrial relations for the Niagara Machine & Tool Works, Buffalo, N. Y. It was announced by George Munschauer, vice president-treasurer of the company.

Along with his new position, Mr. Munschauer will continue as works manager.

Joseph Maezer Head Cincinnati Chapter

Cincinnati—The program for the February meeting of the Cincinnati chapter was highlighted by the election of new officers and included dinner, a technicolor movie presented by the Nash-Kelvinator Corp., and a technical address. Ninety members attended the session held at the Engineering Society headquarters.

Directing chapter activities for 1954-55 will be: chairman—Joseph C. Maezer; first vice chairman—John H. Eltring; second vice chairman—Max Kronenberg; secretary—Moler Duff; and treasurer—Julius Steinhoff.

A lecture by Dr. Horace A. Frommelt, consulting engineer, was sponsored by Detroit Milling Cutter Co., Detroit, Mich. His topic was "New Concepts of Rigidity and Surface Foot Rates in Carbide Milling."

Using colored slides, he showed that carbide milling at rates as high as 1200 surface feet per minute was practical, provided that the carbide bits were made to very close tolerances and were placed in cutter body with the proper rigidity to reduce vibration.

Dr. Frommelt emphasized that, contrary to general belief, carbide milling at high surface rates does not increase wear and tear on the milling machine. For the same horsepower input to the cutter head, the higher the surface rate, the lower will be the curring pressure. Thus, use of higher surface rates in general will increase the life of the machine and reduce maintenance and down time. *—Louis H. Schumann*

Williamsport Elects 1954-55 ASTE Officers

Williamsport, Pa.—Joseph B. Gehret was elected chairman of the Williamsport chapter at the February meeting held at the Moose Club. Other officers named to serve during 1954-55 were: first vice chairman—George E. Lunt; second vice chairman—Dale L. Chubb; secretary—William F. Beach; and treasurer—Lester E. Zimmerman.

Guest speaker at the meeting, attended by about 90 members, was Herman Melzer, division manager of equipment development, Radio Tube Div., Sylvania Electric Products, Inc.

—Philip F. Lynn

Shown at Williamsport chapter's February meeting, seated, are: Harry Featherstone, Herman Melzer, program speaker, and William J. McCoy, chapter chairman. Standing: Dale L. Shubb, second vice chairman-elect, Joseph B. Gehret, chairman-elect, and George E. Lunt, first vice chairman-elect.

New Officers Named at Dayton Election

Dayton—R. J. Dusseau was named chairman for 1954-55 at the February election held by Dayton members. Serving with him will be: first vice chairman—V. J. Boll; second vice chairman—Francis J. Heberling; secretary—W. L. Braun; treasurer—George Brandt; national delegate—R. A. Miller; and alternate delegate—R. J. Dusseau.

After the election, Barnes Drill Co. of Rockford, Ill., presented two discussions on production honing and coolant filtration. These talks were given by James B. Klein and L. L. Fowler. Another short speech was given by Laverne Cogswell, general sales manager of the firm.

J. B. Klein

L. L. Fowler

To help their families become better acquainted with ASTE and its aims and ideals, Dayton members invited them to attend the January technical session held at plant eleven of the Delco Products Corp. A total of 235 turned out for the meeting and enjoyed dinners served in the new cafeteria and later toured the rest of the plant facilities.

The tour was arranged by Roy Dusseau. The fifty wives who attended voiced their enthusiastic approval of the evening's events and asked for a 'repeat performance' next year.

—W. J. Killinger

Controlled Air Power Topic at Racine Meeting

Racine—Ninety members and guests of Racine chapter met at Dania Hall on February 1 to hear L. A. Boese, district manager of The Bellows Co. Chicago office. "Controlled Air Power" was Mr. Boese's topic and he discussed the use of air in machining operations to reduce fatigue and increase production. The sound film "Production Miracles" accompanied his talk.

On the lighter side the group was entertained by the Massey-Harris Mixed Chorus whose director is Gil Hansen of Racine chapter.

—Charles P. Nelson

Nebraska chapter's tour of the Goodyear plant at Lincoln was preceded by dinner at the Italian Village. Pictured at the meeting are: Herbert Bro, secretary; Seb Circo, second vice chairman; Elmer Larson, treasurer; Sam L. Grasso, acting chairman; and Forest Conover, standards committee chairman. Officers named served for the 1954-55 year. The plant tour was made possible through the efforts of Mr. Conover.—*S. L. Grasso*

Tool Engineers' Day Scheduled for April 6

Five ASTE chapters from New York and New Jersey will sponsor their second annual Tool Engineers' Day in New York City on April 6. The full and varied program is expected to draw more than 900 engineers. Sponsoring chapters are: Long Island, host chapter for the event, Greater New York, Mid-Hudson, Northern New Jersey and Paterson.

At the banquet, which will be held at the Hotel Commodore, Roger F. Waindle, national president of ASTE, will be a featured speaker. Others participating in the evening activities are: Morehead Patterson, chairman of the board of American Machine & Foundry Co.; Ralph E. Cross, director of the Metalworking Equipment Section, Business & Defense Services Administration of the Department of Commerce; and James D. Mooney, president of R. Hoe & Co.

Earlier in the day tours of eight plants in the Greater New York area will be made. At the afternoon panel program, T. E. Veltfort, general manager of Copper & Brass Research Association, will act as moderator for a discussion in which national known speakers, representing firms in mining and metallurgical fields, electronics, automatic business machines, chemical processing equipment, and tool and die products, will present important new developments of interest to industry.

R. O. White Heads Wichita Officers

Wichita—Newly elected officers of the Wichita chapter, named at the February meeting, are: chairman—R. O. White; first vice chairman—James H. Janson; second vice chairman—Walter Burnham; third vice chairman—Norman Watkins; secretary—Paul R. Hess; and treasurer—Harold A. Schowalter. Twelve members received ASTE neckties for having obtained at least three new members in the past year.

Ed Haire, technical representative of Dow Corning Corp., Dallas, Texas, was the program speaker. He discussed "Silicones and Their Value to the Tool Engineer."

—John G. Temple

Potomac Chapter Chooses Nominating Committee

Washington, D. C.—At a recent meeting at Hamilton Hotel, Potomac chapter elected its nominating committee which consists of Richard Pinkerton, Preston Whiteleather, and Leo Schade.

Speaker for the evening was P. C. Bossmeyer, optical alignment specialist at the Keuffel & Esser Co., whose topic was "Optical Tooling."—*F. E. Bellin*

Pictured at the February Worcester chapter meeting are: from left to right, John E. Rotchford, retiring chairman; Dr. Horace A. Frommelt, consulting engineer and guest program speaker; and Louis J. Furman, retiring first vice chairman who had to decline the chairmanship because of time-consuming business duties.

Kitchen assignments are made before the February meeting of Peoria chapter. The fine dinner of fillet of pike, (with a special sauce perfected by Head Chef Clancy) was prepared and planned by a crew including: Ed Weber, George Davison, Charles Tobin, Harold Austin, Olin Simpson and Everett Bowton. A total of 275 members and guests approved their efforts!

At the February meeting of Saginaw Valley chapter, members and guests heard a talk by Ernest Hohwart, chief engineer at N. A. Woodworth Co. Pictured from left to right are: George Hohwart, plant manager at Woodworth; Steven Matthews, program chairman; and Mr. Hohwart, the speaker.—*Kent B. Arnold*

Worcester Chapter Names New Officers

Worcester, Mass.—Officers elected by Worcester ASTE members at the February meeting were: chairman—Adam T. Kosciusko; first vice chairman—J. Irving England; second vice chairman—Bernard D. Szarek; secretary—Leo P. Tarasov; treasurer—Andrew Peterson; national delegate—John E. Rotchford; and alternate delegate—Adam Kosciusko.

The chairman of the nominating committee thanked retiring First Vice Chairman Louis J. Furman for his years of devoted service to the Society and announced with regret that the pressure of business had made it impossible for Mr. Furman to accept the office of chairman of the chapter, to which he would have been elected this year.

An illustrated talk on "New Concepts of Rigidity and Surface Foot Rates in Carbide Milling" was presented by Dr. Horace A. Frommelt, consulting engineer.

—*Alvin H. Shairman*

Clifton Bowman Elected Richmond Chairman

Richmond, Ind.—Meeting at the Leland Hotel for the election of officers and a technical session, 50 Richmond members named the following men to guide ASTE activities for the coming year: chairman—Clifton Bowman; first vice chairman—Burnett Mathews; second vice chairman—Henry Naber; secretary—Roger Dull; treasurer—Louis Fabian; national delegate—Russell Culbertson; and alternate—Mervin Culbertson.

Speaker was Edwin Flook of National Automatic Tool Co. in Richmond, assisted by Robert McDaniels.

—*Dezell Gibbs*

Los Alamos Elects 1954-55 Officers

Los Alamos, N. M.—Newly elected officers of the Los Alamos chapter named recently include: chairman—H. J. Von Steeg; first vice chairman—Joseph Bourne; second vice chairman—Robert Kee; secretary—Gordon Anderson; treasurer—Gerald Rodgers; national delegate—Robert Moeller, alternate—Mr. Von Steeg.

"Precision Casting of Aluminum and Magnesium Alloys" was the topic of Raymond H. Osbrink of Osbrink Mfg. Co., Los Angeles. —*H. J. Von Steeg*

Willis Ehrhardt, national director, Howard C. McMillan, third vice president, and J. J. Demuth, ASTE past president, were among the 242 members and guests who attended St. Louis chapter's "old timers' night" held on February 4.

St. Louis Holds "Old Timers' Night"

St. Louis—Twenty-six members of the St. Louis chapter, each with 15 or more years of ASTE membership, were honored with commemorating scrolls at the "old timers' night" meeting held in February. The program also featured a talk on membership standards by Howard C. McMillen, third vice president of ASTE; election of officers for 1954-55; and a technical program presented by Clifford H. Becker, senior tool engineer, White-Rodgers Electric Co., St. Louis.

Elected to office were: chairman—Irwin J. Schumaier; first vice chairman—Harold N. Zimmerman; second vice chairman—Clarence Hall; treasurer—Vincent L. Bene; secretary—Clifford H. Becker; national delegate—Willis Potthoff; and alternate delegate—Irwin Schumaier.

For the technical session, St. Louis members heard ASTE Prepared Technical Program No. 1 entitled "The Forces in Single-Point-Tool Metal Cutting." Excellent slides illustrated each point of the discussion which was read by Mr. Becker. At the close of the meeting, a complete, illustrated text of the program was distributed.

Speaker at the January meeting was J. Y. Riedel, metallurgist, Bethlehem Steel Co. His program on improving production from tools and dies was attended by 258 members of the St. Louis chapters of ASTE and ASM.

—E. Graser, Jr.

Little Rhody Names New ASTE Officers

Providence, R. I.—Little Rhody members met February 4 to select chapter officers for 1954-55. Named to office were: chairman—William Nystrom; first vice chairman—Phil Peckham; second vice chairman—Paul Waterlet; secretary—Carl Friedland; and treasurer—H. Bennett.

Special guest at the meeting was Richard A. Smith, a national director of ASTE and chief tool engineer with Pratt & Whitney Div., Niles-Bement-Pond Co.

Technical speaker was G. A. Ebelhare, manager of Sunthan Corp., Oaks, Pa. Discussing laminated plastics, he explained the differences between laminated and molded plastics. The processes of manufacturing sheets, rods, tubes, and fabricated parts were covered in detail. Machining was discussed, including sawing, drilling, turning, punching, milling, and printing and engraving. *—Maurice A. Schoos*

Michael Pinto Attends Harvard Seminar

Michael Pinto, chairman of the Detroit chapter, was one of five to attend a recent seminar on administrative practices at Harvard University Graduate School of Business Administration in Boston. Sponsored by the Young Presidents Organization, the seminar was a unique experiment to determine the value of concentrated study under the "case history method."

Mr. Pinto, president of Douglas Tool Co., Pioneer Engineering and Mfg. Co., and Douglas Engineering Co., all of Detroit, is also chairman of the Michigan YPO chapter.

Peoria Members Prepare Special Dinner

Peoria—With Carl Clancy as head chef and a group of other ASTE members providing the special dinner, the Peoria chapter enjoyed a de luxe menu at their election night meeting held February 2. Officers who will guide activities for the coming year include: chairman—Victor Schellschmidt; first vice chairman—Wilbur McWilliams; second vice chairman—Walter Ballard; secretary—Leo Johnson; treasurer—William Bahnfleth, Jr.; and national delegate—R. J. Zimmerman.

Student members also elected their officers at this meeting; they are: chairman—Richard Masters; vice chairman—Kenneth Hunt; secretary—James Fornoff; treasurer—Erwin Millen; and advisor—William Logue.

New members who recently joined the chapter include: William Erickson, Curtis Koch, Willard Polk, Ten Powell, Henry Aberle, Earl Gibbons, James Hofstetter, Arvel Mann, Erich Manuel, Walter Mueller, Robert Pokarney, and James Schlosser. *—Russ Saurs*

Niagara District Elects '54-55 Officers

Welland, Ont.—The regular monthly meeting of Niagara District chapter was held at Rose Villa Inn, Welland, on February 4. Officers were elected for the 1954-55 term. Cyril R. Mitchell is chairman; Joseph H. Crawford is first vice chairman; Gordon W. Bishop is second vice chairman; Ralph J. Meacher is secretary; Walter J. Pentesco is treasurer; Chairman Mitchell is the delegate and First Vice Chairman Crawford is alternate delegate.

J. F. Taylor, manager of procurements, A. V. Roe Canada Ltd., Malton, Ont., was the guest speaker.

—William Yaeger

E. C. Polidor Heard at Milwaukee ASTE Meeting

Milwaukee—More than 100 ASTE members turned out for the election night meeting of the Milwaukee chapter. Officers elected include: chairman—Robert E. Bodendoerfer; first vice chairman—Steve Pohlhammer; second vice chairman—Ralph Lund; secretary—Hans G. Frommer; and treasurer—George Riordan.

The technical program was provided by Edward C. Polidor, vice president of Optical Gaging Products, Inc., Rochester, N. Y., *—Walter Behrend*

Chapter Officers Elected by Syracuse Members

Syracuse, N. Y.—The February 9th meeting of the Syracuse chapter found 50 members and guests gathered in the Hiawatha Room of the Onondaga Hotel. After dinner, Chester Ziola, service engineer for the Carrier Corp., presented a stirring and thought-provoking talk on the menace of communism.

Speaker for the technical portion of the program was John Hussey, sales engineer for the American Tool Works, Cincinnati. He chose as his topic "The Hydraulic Duplicating Lathe as a Production Tool."

The business session featured election of officers for the coming year. New officers are: chairman—Eugene Bloom, Lipe-Rollway Corp.; first vice chairman—Victor Fitting, Carrier Corp.; second vice chairman—Andrew Lachner, General Electric Corp; secretary—Paul Hansel, Carrier Corp.; treasurer—Oscar Sterner, Smith Technical High School; delegate—Robert Fulford, Carrier Corp.; and alternate delegate—Chairman Bloom.

—Victor Fitting

Lima Announces Annual Scholarship

Lima chapter announced plans at a recent executive meeting for an annual $250 scholarship for the tool engineering student in the Lima area. It will be awarded to a student in an accredited school who is in his third, fourth or fifth year and is pursuing a course of production and tool engineering as a profession. The first award, according to Barney Bishop, educational committee chairman, will be made this spring and be effective with the school year beginning next fall.

Major Harry Symmonds, left, chief Civilian Air Defense for Connecticut, was the program speaker at the February meeting of the Hartford chapter. The dinner session was held at the Hotel Bond. The following day, on February 2, the Connecticut Day committee held a planning session at the Garde Hotel in New Haven. Robert Toppin was chairman of the event.

—A. Douglas Proctor

Panel of Members Gives Grand River Program

Galt, Ont.—Grand River Valley members named new officers at a meeting held February 5 at Shep's Hall. Elected were: chairman—Percy Barber; first vice chairman—Joseph Strite; second vice chairman—C. Clayton Henderson; third vice chairman—Gilbert Dilly; secretary—John Robertson; and treasurer—Grant Johnstone.

Technical subjects for the evening were handled by a panel of members which answered a wide scope of questions proposed by the rest of the chapter. Participants were: William Durant, Frank Johnston, Orlin McIntyre, John Snider, George Churchill and William Shaw.

—W. E. Little

Metal Experts Talk to Keene Co-Chapter

Keene Co-Chapter met at Kingsbury Machine Tool Corp. for their January 28 meeting. Forty-one members and guests turned out for an educational talk by two metallurgical engineers from A. F. Holden Co., Detroit. They were J. B. Carey and C. R. Brown, both vice presidents of the company.

The topic of the presentation was "Oil and Water Hardening of High-Speed and Tool Steels." Also under discussion were the advantages of salt-bath furnaces. Following the meeting a film on railroading was shown the group.

—D. J. Brown

GE Representative Talks to Erie Members

Erie—Fifty-five members and guests turned out for a recent meeting of Erie chapter including a smorgasbord dinner. The program featured a talk by J. H. Williams on "Business Facts of Life," in which he took a hypothetical example of a small tool and die shop to explain his points. Mr. Williams is assistant production manager of the Locomotive and Car Equipment Department, General Electric Co., Erie, Pa.

—H. W. Sedler

Indianapolis Members Elect New Officers

Indianapolis—Indianapolis chapter held its election of officers at the Sahara Grotto on February 4 and 120 members turned out for the event. Elected were Joe Enright, chairman; Ted Harding, first vice chairman; John Huser, second vice chairman; Lorance Sterns, secretary; Richard Garber, treasurer; Joe Penn, delegate; and Joe Enright, alternate delegate.

Following the election, John J. Thornton, technical engineer for the Fellows Gear Shaper Co. conducted a meeting on "The Art of Generating." Mr. Thornton displayed numerous gears manufactured with his company's equipment and showed two films. "The Art of Generating" demonstrated design of gear teeth, action and contact of gear teeth and applications of the generating principle.

The other film "Gear Manufacturing Equipment" demonstrated the cutting, shaving, lapping, burnishing of gear teeth, and recording instruments for checking involute of profiles.

—M. B. Rosenbarger

Indianapolis officers serving for the coming year are: treasurer—Richard Garber; chairman—Joe Enright; first vice chairman—Ted Harding; secretary—Lorance Sterns; second vice chairman—John Huser; and national delegate—Joe Penn.

Twin States Chapter Hears National Director

Springfield, Vt.—A varied program greeted eighty Twin States members and guests who attended the February election meeting held at the Trade Wind Cafe. National Director Richard A. Smith spoke on chapter functions, changes in the ASTE constitution, and stressed the importance of the new national delegates plan. The president of Rack Engineering and Mfg. Corp., Samuel Saul, Jr., presented a technical talk on "Materials Placement Controls—Its Effect on Manufacturing Costs and Output."

Among the many guests present were: Lieut. Governor Joseph B. Johnson of the state of Vermont; Walter J. Grimm, secretary of Jones & Lamson Machine Co.; Hartness Beardsley, H. Gifon, Donald LeClair, John L. O'Brien, Gordon Sykes, George E. Fuller, Charles H. Harnden, J. A. Anderson, J. C. Harvey, A. L. Knapp, Ronald Scofield, and Walter H. Berg.

New members of the Twin States chapter are: Maynard J. Sirotka, Melvin S. Lee, L. P. Franklin, and R. C. Lincoln.

Two Speakers Highlight Baltimore Program

Baltimore—The Baltimore chapter met on January 6 for its regular monthly meeting. On the technical program, Mr. Young, a sales representative of Engis Equipment Co., Chicago, talked on and demonstrated the use of Taylor-Hobson and Watts optical instruments.

J. Eugene Kennedy, assistant collector of customs, also gave an entertainment talk on "The Customs Story," highlighted by some personal anecdotes concerning things that happened to him in his thirty years around the Baltimore waterfront. —*C. G. Kelley*

Carl Darger Elected Muncie ASTE Chairman

Muncie—Meeting in the Empire Room of the Delawar Hotel on February 1, the Muncie chapter of ASTE saw a film on "Corrosion in Action" presented by C. T. Haller, Jr. of the International Nickel Co., Inc.; and elected officers to serve during the coming year. Named to office were: chairman—Carl Darger; first vice chairman—Vynul Eley; second vice chairman—D. C. Wedlick; secretary—Emmett Blocher; and treasurer—N. Francis Wilson. —*D. C. Wedlick*

Long Island chapter's public relations committee has been very active during the past year. Pictured standing are: C. J. Eckhardt, Delano Ames, George J. Elsbeck, Victor A. Ritz, Charles Nesta, and Alfred E. Fuchs. Seated: Charles H. Wick, Herbert R. Murphy, W. Merritt McBrian, and Theodore Borecki. Mr. Murphy is a past chairman and Mr. McBrian is the present chairman.

Long Island Elects 1954-55 Officers

Westbury, N. Y.—At the February election meeting held by Long Island chapter, the following officers were named to serve for the coming year: chairman—George Bennett; first vice chairman—George McLaughlin; second vice chairman—John Hatter; secretary—Mrs. Sara T. Moxley; treasurer—Sheldon Meyers; and national delegate—Arthur Cervenka.

The 115 members present for the dinner session also heard a technical talk made by C. T. Williamsen, field representative for Eutectic Welding Alloys Corp., Flushing, N. Y. He presented an illustrated lecture entitled "Practical Salvage of Tools through Welding."

On January 25 the third in a series of panel discussions was presented by Long Island ASTE members at Long Island Agricultural and Technical Institute. A panel of six speakers, each with considerable experience in the field of blanking, discussed numerous aspects of the blanking operation before an audience of fifty members.

Participating were: Edward James, head of the die program at Metalab Equipment Co., Hicksville, N. Y.; Fred Beck, chief inspector at the General Bronze Co., Garden City, N. Y.; Roland Kainen, until recently in charge of the die program at Grumman Aircraft; George Schwobel, head of all die work at the B & H Aircraft Co., Farmingdale, N. Y.; and Cassimir Rakowski, instructor in the mechanical department at Long Island Agricultural and Technical Institute.

Student members of the Long Island chapter met January 19 to hear a discussion on methods engineering. Program speaker was Norbert Graber, methods engineer for Control Instrument Co., Inc., Brooklyn, N. Y.

—*Sara T. Moxley*

Fond du Lac Members Hear Research Director

Kaukauna, Wis.—Program speaker at Fond du Lac chapter's February meeting was Bernard Better, director of research at Scully-Jones & Co., Chicago. He presented an illustrated talk on production tool development.

Covering the importance of tool research and development, Mr. Better discussed his development work on safe-torque drivers for taps. He also explained the many steps required in carrying out an effective tool development program.

The dinner meeting was held at the Elks' Club. Also on the agenda were a discussion of the changes in the ASTE constitution and by-laws, and the annual election of officers.—*H. S. Faith*

Oil Company Executive Retires from Company

The retirement of Thomas C. Bradford has been announced by F. E. Anderson, president of the F. E. Anderson Oil Co., Portland, Conn. At one time sales manager of the company, Mr. Bradford traveled the United States and Canada, appointing company distributors and agents.

Coming MEETINGS

PHILADELPHIA—April 26-30. American Society of Tool Engineers' Industrial Exposition and 22nd Annual Meeting.

ATLANTA—April 19. "Use of Weldments in Tool and Machine Design" by A. W. Zeut'en, materials engineer, Tempil Co p., New York City.

BUFFALO-NIAGARA FRONTIER—April 8. Plant tour.

CALUMET AREA—April 21. Vogel's Restaurant, Whiting, In l., "Induction Heating" by Dr. Harry B. Osborn, Jr., technical director of Tocco Div., Ohio Crankshaft Co., Cleveland, and second vice president of ASTE.

CANTON—April 22. "Broaches and Broaching" by James W. Dopp, service engineer for Lapointe Machine Tool Co., Hudson, Mass.

CINCINNATI—April 13, 8 p.m., Engineering Society of Cincinnati Headquarters. Program tool and die welding by Frank E. Kessler, engineer at Welding Equipment and Supply Co., Detroit.

CHAUTAUQUA-WARREN—April 15, 6:30 p.m., Jamestown, N. Y. Tour of Marlin-Rockwell Corp.

CHICAGO—April 16, 1 p.m. Afternoon tour of Electro-Motive Div., General Motors Corp., LaGrange, Ill.

CLEVELAND—April 9. "Making Good Tool Steel Perform Better" by A. J. Scheid, vice president in charge of Metallurgy, Columbia Tool Steel Co., Chicago Heights, Ill.

ERIE—April 6, 6:30 p.m., GE Community Center. "Files by the Nicholson File Company" by a representative of the company.

FAIRFIELD COUNTY—April 7. "The Uses and Abuses of Twist Drills" by a representative of the Cleveland Twist Drill Co., Cleveland.

FOX RIVER VALLEY—April 27, 7 p.m., VFW Hall, St. Charles, Ill. Speaker J. R. Reinertson of J. R. Reinertson & Co., Chicago.

GRAND RIVER VALLEY—April 2. "Micro-Switches" by a representative of Minneapolis Honeywell Co.

GREATER LANCASTER—April 13, 6:45 p.m., Arcadia Cafe, Lancaster, Pa. "Resistance Welding" by William J. Farrell, chief application engineer, Sciaky Bros., Inc., Chicago.

HAMILTON—April 23, Burgundy Room, Fischer's Hotel. Ladies' Night.

John A. Harrington, chief engineer of the DoAll Co., spoke to 60 members of the Santa Clara chapter at their January meeting. His subject was "Wheel Dressing." Pictured with him are, from left: John McCarthy, Carl Kaiser, V. H. Gallichotte of the National Profession Engineering Committee, and Roy Bedell of DoAll.
—Glenn Herreman

INDIANAPOLIS—April 1. "Au matic Gaging" by Stanley Nicolas, c f inspector, Merz Engineering, I - Indianapolis.

LIMA—April 16, 6:30 p.m., Roy Pine Room, "New Developments in rinding Carbides" by Fred J. Ben f the Norton Co., Toledo, Ohio.

LITTLE RHODY—April 1, 7 p.m. Johnson's Grille, Providence, R. I. " letalworking" by E. J. Tangerman, litor, American Machinist Magazin

LOUISVILLE—April 13, 6:30 p.m., L & N YMCA. "A Method o Reasoning for Tool Design" by J. I. Karash, production manager, Reliance Electric & Engineering Co., Cleveland.

MID-HUDSON—April 13. Joint meeting—Quality Control.

NEW ORLEANS—April 13. "Gages" by William Wilt of Sheffield Corp.

NEW YORK CITY—Second Annual Tool Engineering Day, at Hotel Commodore. Long Island chapter host to Greater New York, Mid-Hudson, Northern New Jersey and Paterson chapters. Plant tours, a panel discussion and a banquet will make a day-long program of activities.

NIAGARA DISTRICT—April 1, 7 p.m., Barclay Hotel, Welland, Ont. "Electrical Control of Machine Tools" by E. E. Opel, electrical engineer, National Automatic Tool Co., Inc., Richmond, Ind.

PITTSBURGH—April 2, 6:30 p.m., Sheraton Hotel. "Small Tools for Industry" by a representative of Brown & Sharpe Co.

SCHENECTADY—April 8, 8 p.m., American Legion Post No. 21. "Tooling for Induction Heating" by Dr. Harry B. Osborn, Jr., technical director of Tocco Div., Ohio Crankshaft Co., Cleveland. Dr. Osborn is also second vice president of ASTE.

SPRINGFIELD, MASS.—April 12, 7:30 p.m., Springfield Turn-Verein. "Precision Investment Casting" by G. R. Barrow, field engineer, Haynes Stellite Co., New York, N. Y.

SYRACUSE—April 24, Roof Garden, Onondaga Hotel. Dinner dance.

TRI-CITIES—April 14. Plant tour of Northwestern Steel and Wire Co., Sterling, Ill.

TWIN STATES—April 14, Hotel Moody, Claremont, N. H. "Shell Molding and Plastics as They Affect the Tool Engineer" by a representative of Monsanto Chemical Co., Springfield, Mass.

Twin Cities Elects Chapter Officers

Minneapolis—The election of chapter officers was first on the agenda for the February meeting of Twin Cities chapter held at The Covered Wagon. Some 145 turned out to exercise their franchise and elect Jerome W. Schwartz as chairman, Robert M. Johnson as first vice chairman, Philmore W. Armstrong as second vice chairman, Louis M. Walton as secretary, Arnold R. Lindfors as treasurer, C. Eric Fasth as delegate, and Wallace A. Ahlberg as alternate delegate.

W. O. Sweeney, assistant vice president of Arwood Precision Casting Corp., Brooklyn, N. Y., was the guest speaker for the evening. Illustrating his talk with slides and a sound-color film, he pointed out that precision investment castings can be cast in most brasses, bronzes and many ferrous alloys. He added that proper design is all-important and generous fillets and properly located gating are essential in obtaining sound castings. —*Walter J. Comstock*

Ladies' Night Highlight on South Bend Calendar

South Bend—The Oliver Hotel was the scene of the January Ladies' Night held by South Bend chapter. Dinner, prizes and a talk by Edward McFall on "How's Your Sense of Humor" were on the evening's entertaining agenda.

—*Matthew J. Nowak*

Springfield chapter's February program was presented by Dr. W. N. Delenk, center, technical sales consultant for the Fuller Brush Co. Shown with him are: Robert M. Dickson, chapter chairman for 1953-54; Wendell T. Ingham, technical chairman; Ray U. Olsson, program assistant; and Peter F. Scott, newly elected chairman of the chapter.

Peter Scott Named Springfield Chairman

Springfield, Mass.—New officers of Springfield's ASTE chapter were elected in February: chairman—Peter F. Scott; first vice chairman—Hollis B. Moore; second vice chairman—Kenneth R. Blaisdell; treasurer—Karl F. Kuralt; and secretary—Robert M. Marquiss.

The technical program was presented by Dr. W. N. Delenk of the Fuller Brush Co., who spoke on industrial brushes. He was assisted by Ray V. Olsson of the same company and John J. Horan, general plant foreman, Hunter Machine Co., North Adams, Mass. —*George H. Foy, Jr.*

Firth Sterling Speaker Gives Madison Program

Madison, Wis.—Malcolm Judkins, sales and development engineer, Firth Sterling, Inc., Philadelphia, was the technical speaker at Madison chapter's January meeting. Sixty members attended the session held at Leske's Steak House. Mr. Judkins' subject was new applications of sintered carbide tools in cutting high heat jet alloys.

The coffee program was presented by Arnold Griswold, chairman of the ASTE education committee and instructor in engineering at the University of Wisconsin. He showed super slow motion movies of carbide milling tools cutting various metals. The films were designed to stop action of high-speed cuts for study purposes.

Among the guests were Rip Valoon of Firth Sterling's Chicago office and Mr. Rindquist and Robert Bodendoerfer from Milwaukee. —*A. J. Mergen*

Kansas City student members were host to the senior chapter for the January meeting held at University of Kansas. Here, Jack Needham, left, examines an imported jig-boring machine, while Prof. Howard Rust, center, points out features to an unidentified guest. The welcome was given by Gene Brunson, student chairman during 1953-54. Conducting of the meeting was shared by Richard Staadt, incoming student chairman, and Merlin Grundy, Kansas City chairman. Technical speaker was Stanley Skoglund, Lindbert Steel Treating Co., who talked on heat treatment of tool steels.—*Richard W. Corliss*

Steel Company Executive Presents ASTE Program

St. Charles, Ill.—Officers elected at the February meeting of the Fox River Valley chapter include: chairman—Donald E. Gierk; first vice chairman—Willard C. Perkins; second vice chairman—Robert J. Evans; secretary—Charles A. Olson; and treasurer—Harold Smith.

Program speaker was A. J. Scheid, Jr., vice president in charge of metallurgy, Columbia Tool Steel Co. He showed pictures of his firm and its methods of manufacturing, giving a detailed report on using the right steels for specific applications.

—*W. C. Perkins*

Los Angeles officers elected at the February meeting, from left, were: chairman—J. E. Riddle; first vice chairman—Paul B. Slater; second vice chairman—Frank X. Bale; treasurer—Paul Lenk; secretary—S. W. Winquist; and national delegate—Carl L. Almquist.

Eddie Riddle, newly elected Los Angeles chairman, receives the congratulations of Carl Almquist, immediate past chairman.

Los Angeles Contest Nets 102 New Members

Los Angeles—The coveted prize of tickets to the Rose Bowl football game was awarded to N. I. McCabe and his team of "49'ers" who brought in the most new members in Los Angeles chapter's Rose Bowl membership contest. Although the big game ended one phase of the chapter's current membership campaign, the drive was extended until the end of February. As of January 1, 1954, a total of 102 new members are now associated with the Los Angeles chapter.

In the technical field, the chapter heard a talk by Paul S. Anderson, sales manager of Arcturus Manufacturing Corp. at its January meeting. A record attendance of 405 members and guests was present for the discussion on "Forging to 0.010 Inch." Mr. Anderson was assisted by E. C. Rork, plant manager, who showed some of the unusual precision forgings which had been made under his direction.

—Roland Hamel.

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New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 8120 Blue Ash Ave., Cincinnati 36, Ohio.

Wayne Ewing Addresses Golden Gate Members

Oakland, Calif.—Speaking at the election meeting of the Golden Gate chapter, Wayne Ewing, national assistant secretary-treasurer of ASTE, discussed the new national delegate plan whereby closer ties can be established between the chapters and national headquarters.

New officers of the chapter are: chairman—Dean Roulund; first vice chairman—Vernon Gallichotte; second vice chairman—Ted Lindquist; secretary—Philip Freeman; and treasurer—William Burge. *—Philip Freeman*

Armstrong Cork Co. Scene of ASTE Tour

Lancaster, Pa.—Meeting at the Armstrong Cork Co., 124 members of the Greater Lancaster chapter elected officers to serve for the coming year. They are: chairman—Truman Coy; first vice chairman—Martin M. Sensenich; second vice chairman—Reynold E. Schenke; secretary—Theodore E. Morrison; treasurer—R. H. Moser; national delegate—Willis M. Houck; and alternate delegate—Raymond C. Moorhead.

The technical talk was given by Robert W. Powl, plant engineer, Lancaster floor plant of Armstrong Cork Co. *—George S. Coil*

J. R. Reinerston, second from right, midwest manager for Pivot Punch and Die Corp., spoke to a record crowd of 150 Kansas City members and guests at a recent technical meeting. Shown with him are: Edwin Benson, assistant vice president and plant manager, Benson Mfg. Co.; Murray Myers, tool supervisor, A.G.T. Div., Westinghouse Electric Corp.; and Roger Craig, chief of mechanical design, Wilcox Gay Co. *—Richard N. Corliss*

News in

METAL WORKING

SPECIAL DRILLING PROBLEM BRINGS ABOUT AUTOMATIC UNIT

Equipment replacement being carried on in an extensive program at Hayes Steel Products Ltd. includes a special purpose drilling machine to produce I beam front axles for trucks, an output rate of 32 finished drilled axles per hour at 80 percent efficiency. The machine, recently completed by Modern Tool Works Ltd., of Toronto, Canada, was engineered and built in close co-operation between the engineers of the two companies.

Design of these axles demands that critical relationships be maintained between king pin holes and the holes in the spring seat pads for center bolts and spring U bolts. The problem involved symmetrical location of the king pin holes and the spring seat holes about the center line of the axle; while drilling of the king pin holes had to be in the center of the bosses provided on the ends of the forgings. Since the forgings, after straightening, may vary as much as ¼ in. between the centers of the bosses, there exists a problem of compensation when all holes are to be drilled simultaneously. This condition exists for forgings of any given design. However, in this case, the designers also contend with a multiplicity of axle designs, differing in physical size, shape, hole diameters and hole positions.

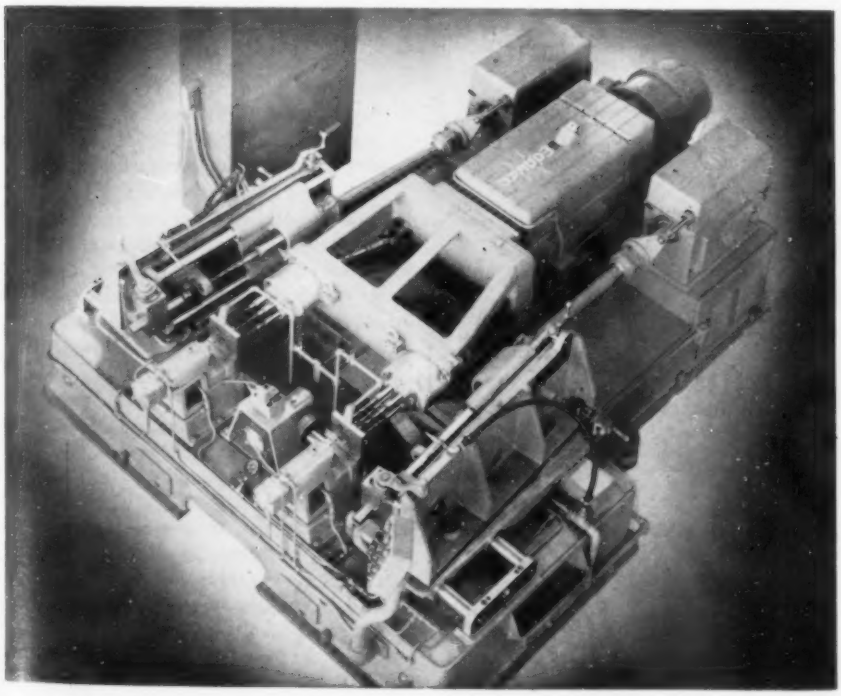
Resultant design made to meet these conditions was the machine pictured. It offers flexibility required to accommodate all the various truck axle designs encountered and features automatic compensation for variation occurring between like forgings.

Outstanding feature is a compensating device which allows adjustment, by the machine, of the drilling spindles to suit the forging while at the same time centralizing the forging to the spindles which drill the spring seat pads. Thus the two required conditions of relationship to maintain king pin holes in the center of bosses are produced in one setting.

Three standard hydraulic feed units are the nucleus of the machine's design. The largest unit, a HDH-18, drills the holes for spring center bolts and spring U bolt holes. LDH-12 units drill the king pin holes. Since these are hydraulic feed units, the feed rate is infinitely variable for different drilling conditions. Further, to advantage, the LDH-12 units have provision for skip-feeding required to maintain maximum production when drilling king pin holes in axles having clevis-type ends.

The compensating device, which positions the axle forging centrally and adjusts the drilling spindles for king pin holes, consists of two movable assemblies which carry the drilling spindles, spindle slides, drill bushings thrust supports blocks and V block locators in unvarying relationship.

High angle view of I beam front axle drilling machine, free of work, permits study of relationship of various units. Note the kingpin drilling spindles move in and out in the manner of self-centering vise jaws.

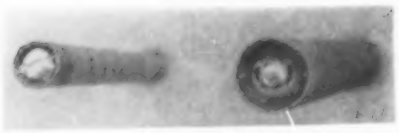


COATED WELDING ROD GIVES SPEED AND QUALITY

Metal fabricating industries now have a development offered them in the welding field that promises speed increases as much as 50 percent with a smooth and spatter-free appearance.

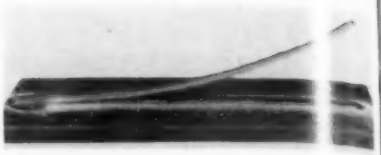
It involves electrodes coated heavily with a substance containing large quantities of powder metal. The advantage of this coated electrode is that the current used in welding may be more completely and effectively utilized. The electric arc drawn from the end of a welding electrode performs three functions: melting the core wire, melting the coating of the electrode, and melting the edges of the parts to be welded together. Normally, welding speed increases with increased welding current. However, a maximum current eventually is reached—and this results in difficulties that make the operation unsatisfactory. It may be an overheated electrode causes a breakdown of the coating; or it may be too much penetration, gouging of the parent metal, or too much spatter. These are the current-limiting difficulties the newer electrode design is expected to overcome.

The coated electrode makes use of the



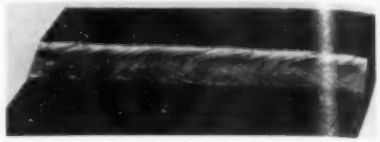
Partially used conventional electrode at left, with powder metal coated rod, right, shows comparison of coating thickness and how crucible forms in the end of the powder metal coating.

excess heat thrown off during the normal arc-welding process, to melt the powder metal coating, which then becomes an additional source of metal for the weld. Obviously, this permits an increase in welding speed. Excess current, spatter, gouging and undercutting are minimized and additional metal is available to make full welds at the higher speeds. Coincidentally, the more efficient use of arc heat by using it for the coating, reduces overheating in the electrodes. With these coated electrodes, therefore, the only apparent limit to welding speed is the maximum current which the size of the core warrants. Danger of overheating the electrode, or core wire to a red-hot stage naturally will break down the coating so that it cannot perform properly.



Above, slag formed from powd metal coating has lifted itself from e bead as it cooled.

Below, sample of welding prod ced by the coated rod, shows quality o work.



While there is practically no limit on current used with the coated powder metal-coated electrode, attention to the balance between coating and core wire is important. It has been found through use that if an electrode contains sufficient iron powder in the coating to supply one-third of the deposited metal from the coating and two-thirds from the core wire, that electrode can deposit metal 50-percent faster than the same size uncoated electrode.

Too much iron in the coating will take so much of the heat from the arc, due to the iron powder melting process, that not enough will remain to melt the parent metal and core wire.

FAST INTERNAL BROACHING FOR LARGE PIECES

Large components requiring two passes can be broached internally from start to finish with the new broach handling setup developed by Colonial Broach Co. of Detroit. Direct benefits, of course, are increased production and reduced handling of an ingenious broach handling arrangement. This setup, on a 50-ton, 72-inch stroke, pull-down broaching machine can be used for internal broaching of involute splines, straight splines, squares, rectangles and irregular shapes, etc.

Normally such parts are put through a roughing and semi-finishing pass, stacked near the machine and then finish broached after the broaches are changed—four handlings. (Into the machine for the first pass, out of the machine for stacking, back into the machine for the second pass and, finally, out of the machine after they are finished.) Obviously, it is inconvenient and expensive to handle large, heavy parts this often. In addition, changing broaches is time consuming and requires care to prevent damage to the cutting edges.

Emphasis is on automation for tools rather than on the work. Major im

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ASTE SHOW, PHILADELPHIA, APRIL 26-30

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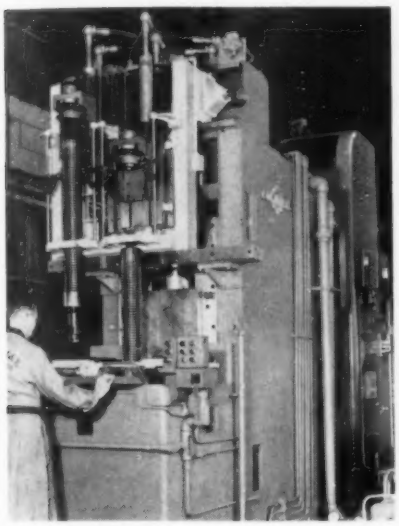
...ent in efficiency results from the ...tion of Colonial's dual sliding ... handling support. The part to ...ached is placed in position on a ...dically actuated receding table ...equires no further handling un... ...mpletion of automatic cycle. The ...d part is then removed and sent ... to the next manufacturing opera...

... start the cutting cycle, the operator must depress buttons at both sides of the machine, guaranteeing that both hands are clear of the machine. Once the cycle is started the following sequence is automatic: (1) Receding fixture brings the part into cutting position; (2) Initial pass broach is pulled through part; (3) Fixture recedes to clear broach; (4) Broach is returned to handling puller at top of machine; (5) Dual sliding broach handling support shuttles to the left carrying the second pass (finishing) broach into cutting position.

To finish the job, the table moves into cutting position and the second or



finishing pass is identical to the initial pass, including return of the broach to the handling pullers. The sliding broach handling support shuttles to starting position and stops automatically, ready to begin another cycle, while the finished part is being unloaded and a new part is loaded.

Entire system is electrically controlled and has hydraulic interlocks to insure positive positioning of all components in the machine cycle. Circuit is also arranged for jog cycle to set up or try out the machine. Handling pullers are equipped with limit switches, requiring full engagement of the broach and the handling puller before the shuttling fixture controls are energized to permit sideways movement of the broach handling supports and approach of the worktable to cutting position.

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

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to Investigate the Qualities of

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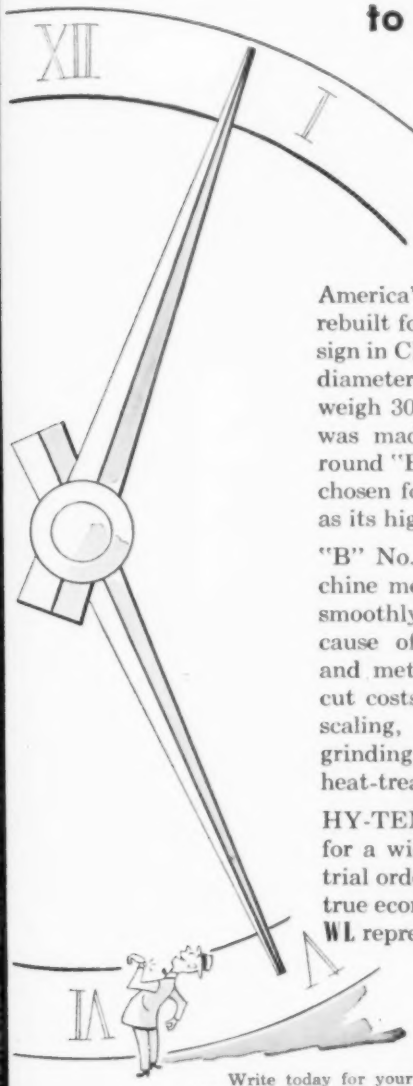
ALLOY STEEL



America's largest clock was recently rebuilt for a spectacular illuminated sign in Chicago. It measures 50 ft. in diameter — hands and movement weigh 3000 lbs. The new driveshaft was made from 6 ft. of 3½-inch round "B" No. 3X heat-treated bar, chosen for its machinability as well as its high physical properties.

"B" No. 3X heat-treated bars machine more readily and finish more smoothly than standard alloys because of their particular analysis and method of manufacture. They cut costs by eliminating distortion, scaling, straightening — and often grinding — as well as the cost of heat-treating finished parts.

HY-TEN "B" No. 3X bars are used for a wide range of applications. A trial order will convince you of their true economy. Just call your nearest WL representative.

Write today for your FREE COPIES of Wheelock, Lovejoy Data Sheets, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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TOOLS of today

Automatic Drilling Unit

An electromechanical drilling machine developed by the Hillyer Instrument Co., 54 Lafayette St., New York 13, N. Y., automatically drills a center hole on a flat metal sheet of any shape as well as on castings without layout. It will also drill Bakelite, slate and marble, and crackle finish metal.

With this automatic drilling unit, hole location is reduced to X and Y dimensions being set on decimal dials in a control board which is separate from the machine. The operator merely presses a button to put the machine in motion; the drill automatically positions itself and drills the hole to a predetermined depth. At work any number of holes can be located and drilled in a fraction of previously required time.

The machine will be shown for the first time at the ASTE Exposition in Philadelphia. **T-4-1841**

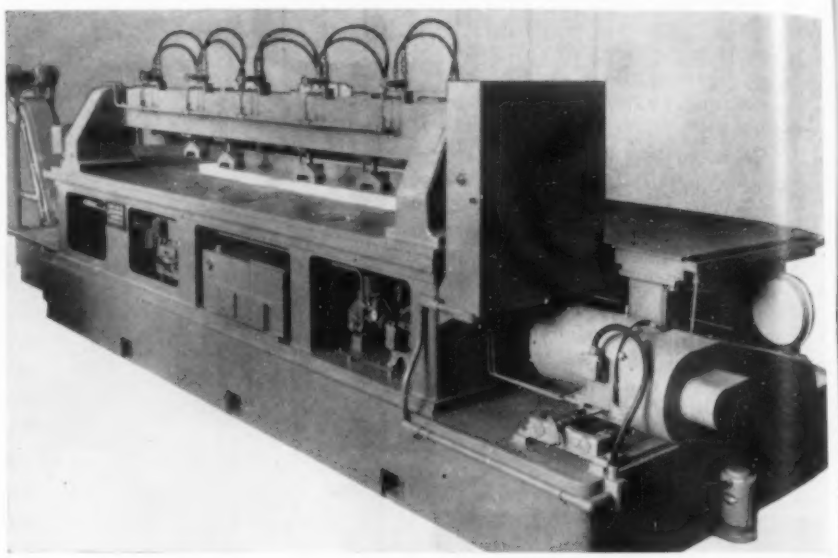


Plate Saw

Aluminum plates up to 4 inches thick by 12 feet long can be handled accurately by the high-speed plate saw introduced by The Motch & Merryweather Machinery Co., Penton Bldg., Cleveland 13, Ohio. Coolant sump, chip compartment and chip conveyor are built into the base.

Surface of the plate is equipped with free rollers in small cylinders, actuated hydraulically to raise the stock from the surface of the table, enabling the operator to position the stock more easily. Rollers are provided in two directions, each under the control of the operator. The stock is clamped by a heavy rail with direct-acting hydraulic cylinder hold-down clamps, each of which has a shut-off valve to make it inoperative if it is not needed.

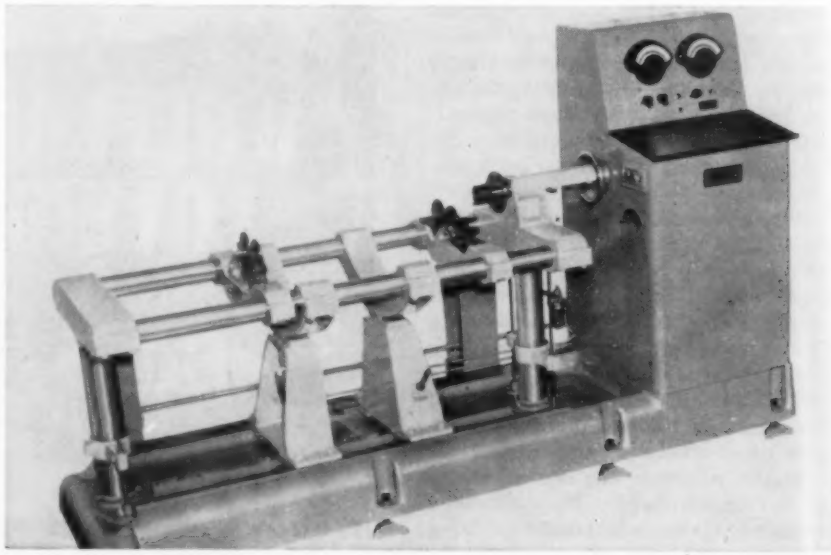
A single-speed saw head is mounted on a dovetail slide beneath the table. Variable feed rate of this head is provided by a vari-drive at the right-hand end of the table through a feed screw and nut arrangement.

An automatic cable take-up reel supports the power cable to the motor on the saw head carriage. An adjustable fence squares up the stock. **T-4-1843**

Electronic Balancing

Tinius Olsen Testing Machine Co., Easton Rd., Willow Grove, Pa., has introduced an unusual type of electronic balancing machine. Key feature of this machine is the Electodyne electronic system which instantly and automatically indicates the amount and angular location of unbalance on two meters.

Both a horizontal static-dynamic model, and a special automatic vertical static balancing machine will be shown at the ASTE Industrial Exposition in April. **T-4-1842**



USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

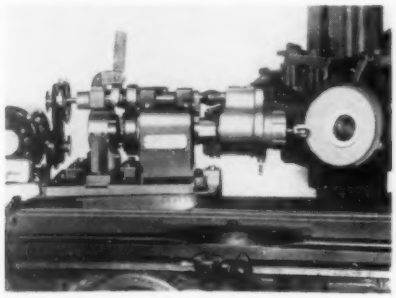
Circularity Grinding Attachment

Detroit Reamer & Tool Co., 2830 E. Seven Mile Rd., Detroit, Mich., has a Circularity grinding attachment, which is said to be faster, easier to handle, has positive control and greater adaptability.

Identified as Model 500, the unit is precision built to provide fine precision work.

The motor driven Circularity grinding attachment simultaneously revolves the work to be ground and moves it longitudinally back and forth. This simultaneous operation is the result of direct gear drive from drive shaft to collet housing gear and spacer gear.

Standard spacer gears with a follower pin for each flute to be ground, provide indexing for 2, 3, 4, 6, 8 or 12 flutes. Special spacer gears can be



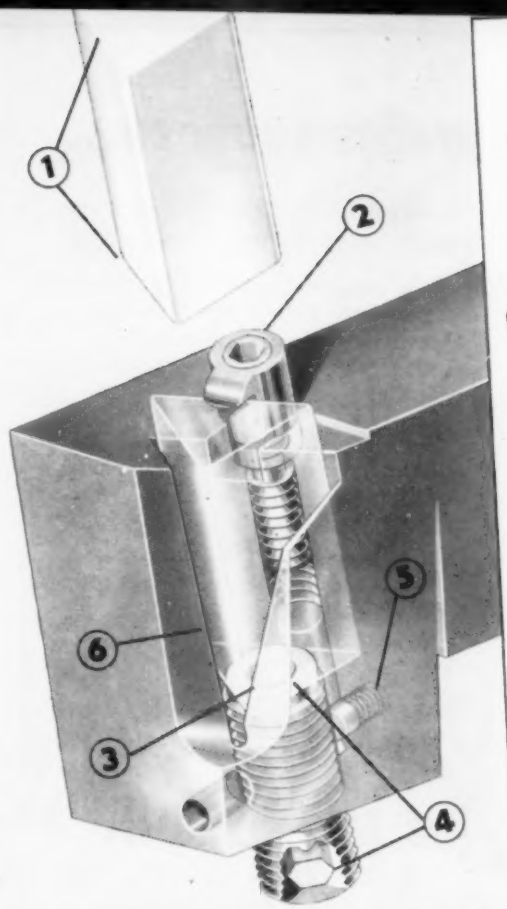
provided when number of flutes differ from those listed. The number of back and forth movements per revolution of work is controlled by number of follower pins used in spacer gear.

Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, radial relief, form and radial relief together, tapered cylindrical and straight cylindrical. Cutting tool to be produced or reworked is held in collet or between dead centers and revolves on its own axial center. Where full length of a spiral cutting tool is to be ground for both form and radial relief, the grinding attachment ravel is similar to an OD grinder, which insures fine finish, back taper and accurate size. **T-4-1851**

Universal Jig Borer

It is possible to produce both small and large runs without complicated fixtures, through use of the recently developed Alfing universal fine borer, Model HFS O/K 250 being introduced by Morey Machinery Co., Inc., 383 Lafayette St., New York 13, N. Y.

This varied work is accomplished by the arrangement of the worktable with optical settings. The height of the knee and the cross adjustment of the table



FEATURES of TOP-CLAMP KENNAMATICS*

1. Indexable Kennametal* insert, preground on both ends—provides six or more cutting edges (depending on style) before sharpening is required.
2. Rugged clamp and screw is interchangeable on all standard Kennamatic styles and sizes.
3. Hollow back-up screw facilitates removal of snug-fitting (frozen) insert.
4. Hex sockets on both ends of back-up screw for quick adjustment or changing of insert, from either top or bottom.
5. Nylon plug, and spring, for friction locking of back-up screw.
6. Ample clearance at front of holder eliminates shank abrasion from "chip wash."

...For Getting Jobs Done FAST!

Kennamatic* features help get the most out of a machine because there's far less downtime for tool changing when you put these multiple-edge, indexable insert tools to work. For example:

Conventional brazed carbide tools, used to rough turn SAE 1140 sleeve yokes, machined only 100 to 125 pieces per grind, and 1000 to 1250 per tool life.

Kennamatic tools were put on the job. Operating conditions and machining time remained the same, BUT—9 times as many pieces are now turned per tool grind, and 10½ times as many per tool life.

Tool cost is now only one-sixth of the former amount—and production is higher because of less downtime.

Kennamatic inserts have Kennametal's high hardness and wear-resistance for long life. Clamped-in, they can be indexed in seconds to new cutting positions without removing or resetting the tool . . . a great time-saving feature. After all cutting edges at both ends of an insert have been used, they are resharpened by squaring off the ends and grinding chip breaker, if desired—no precise angles to form; no steel to grind.

Only Kennametal makes Kennamatics. Ask your nearest Kennametal tool representative to help you apply this cost-saving tooling to your production or job lot operation. Kennametal Inc., Latrobe, Pa.

HOW KENNAMATIC* WORKS

1. Kennamatic* insert—round, square, triangular, or diamond shaped—is precision ground. It is placed in holder, adjusted to cutting position with back-up screw, locked into place by tightening clamp nut.

2. When one edge of insert becomes worn, clamp is released, and insert is turned to new cutting position. When all cutting edges of both ends have been used, the insert is easily reground.

3. Worn inserts are sharpened simply by facing off both ends.

Back-up screw is adjusted (from either top or bottom) to bring cutting point to center.

*Registered Trade-Marks

KENNAMETAL*
CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY
SALES OFFICES IN PRINCIPAL CITIES

A-13

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. . . Because today's market demands lower manufacturing costs? And yours aren't low enough?

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Our production engineers, specialists in all phases of industrial engineering, find and correct those factors in your plant that contribute to excessive manufacturing costs. Often, our design engineers can further reduce costs by redesigning your product for manufacturing economy or we can take your ideas, sketches and specifications and develop a completely new product.

Why not see what we can do for you—call, write or wire today. There is no obligation.

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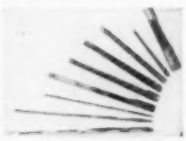
SHOW STOPPERS at BOOTH 235

Any and every KEYWAY (1/16" to 1") broached by hand with arbor press in one minute for as little as one cent each, with du MONT *Minute Man* KEYWAY BROACH KITS.

See demonstration at the Show

Special Broaches? See 'em at the Show or mail us your prints — pull type, push type, keyseating machine. Get 'em from du Mont quick, at low cost because we're tooled up for 'em. (This means broaches under 36" length and 20" cutting sections, *not* round, spline, rifling or irregular shaped, nor square broaches less than ¼" across flats.



Tool Bits by du Mont — Square and Rectangular, Super High Speed, Ground. du Mont Bits are precisely blended and *balanced* to *do most* cutting, take a keener edge, stay on the job longer. A trial will convince you. See 'em at the Show.

Everyone who visits Booth 235 will see how to save minutes and money with the *Minute Man* MAGNETIC BASE for positioning dial indicator gages at the most convenient and effective spot. Puts 'em there *quick*, and *keeps* 'em there.

The du MONT CORPORATION, Greenfield, Mass.
Mail complete information and price list C on

☐ Minute Man KEYWAY BROACHES & KITS
☐ Minute Man SPECIAL BROACHES
☐ du Mont Super H. S. TOOL BITS ☐ Minute Man MAGNETIC BASES

Name .....
Company .....
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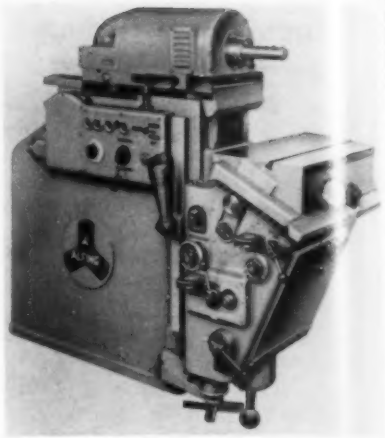


are combined with the optical reading device for accurate setting of the machine.

Both feed movement of the headstock slide, which is infinitely variable from 0.236 to 12 ipm, and the longitudinal traverse of the cross slide are controlled hydraulically. Quick return movement takes place at a speed of 114 ipm. Actual hydraulic feed values, with regard to the headstock slide and the cross slide, can be read accurately from an especially provided feed indicator.

Spindle speed of the headstock is infinitely variable within a range of approximately 300 to 3000 rpm by means of a set incorporated into the body of the machine. The height adjustment of the worktable is performed by means of the vertically adjusted knee. Coarse adjustments are effected mechanically through a gear driving motor, and fine adjustments by a laterally arranged hand wheel, one turn of which results in a height adjustment of 0.0047 inch.

T-4-1861

Shaver for Internal Spur or Helical Gears

Precision shaving operations on internal spur and helical gears from 3 to 12-inch pitch diameter is done with the Red Ring gear shaving machine announced by National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.

Unlike other types of internal shavers, this tool, Model GCR, is designed specifically to finish only internal gears, and can shave gears having up to 4 diametral pitch teeth and face widths up to 2½ inches.

Among the design features of the new shaver are a workhead that permits taper shaving operations with an optional pivoting feature that facilitates loading and unloading of internal gears such as those having wide faces or integral long shafts.

In addition, it incorporates a precision differential automatic upfeed mech-

which includes a master cam that as a step gaging device to accu- control feed increments, finished and return to backlash position.

tional high production plunge-cut ing (cutter feed without work or reciprocation) is still another re.

sign of the machine is calculated void suspension mounting of prin- machine elements, thereby reduc- deflections and providing maximum dity and precision.

Centralized pushbuttons operate con- ls for both setup and operation.

Shaving action is accomplished by crossed axes principle. Work is

mounted on a driving head with its axis in a horizontal plane. A gear shaving cutter engages the work gear with the cutter spindle centerline set at a crossed axis angle with the work gear.

Either conventional or plunge-cut shaving methods can be performed on the Model GCR. With the conventional method the work drives the cutter and the cutter is reciprocated across the work face. The cutter is automatically fed vertically at the end of each stroke and allowed to dwell at finished depth before being retracted.

When the higher production plunge-cut method is used, the work drives the cutter the same as with the conventional method, but the cutter is fed to depth without reciprocation. **T-4-1871**

Heavy-Duty Air Cylinder

The S-P Mfg. Corp., 12415 Euclid Ave., Cleveland 6, Ohio, has made available a heavy-duty line of air cylinders especially suited for automation applications as well as for general use on conveyors, dies, machine tools, presses and welding machinery.

They are produced in five types of mountings and in eight bore sizes from 1½ through 6 inches.

Designed to operate at pressures up to 200 psi, they have a cartridge type rod packing and bearing, which makes possible a quick change of packing with minimum down time.

Additional features of the new S-P

TOOL UP...

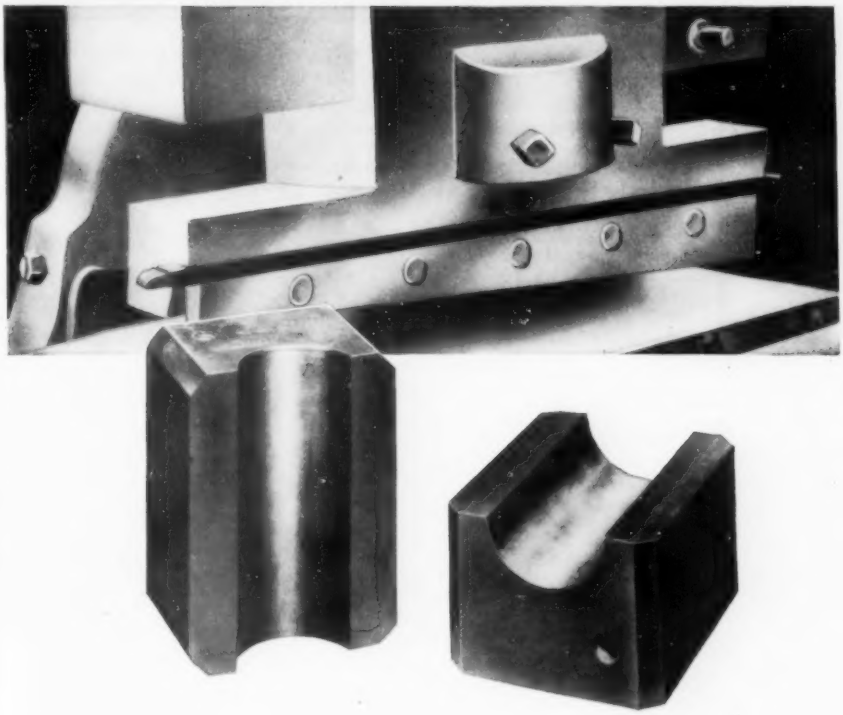
to lower production costs

Darwin

MINEOR

5% Chrome Air Hardening

TOOL STEEL



Case history after case history tell us that Darwin's MINEOR is the top performer in its price bracket. Used as recommended by our engineers, Darwin MINEOR has proved time after time that it will outperform and outlast competitive steels. We'd like nothing better than to have you make us prove these claims—by calling a Darwin sales engineer . . . by making a side-by-side comparison in your tool steel application.

Complete line of highest grade Tool Steels, including PRK-33, NEOR, MINEOR, OHT, "MT6" and and various grades of Hot Work Specialty Steels. Furnished in Bar Stock, Billet and Sand Casting, Drill Rod, Flat Ground Rod and Tool Bits.

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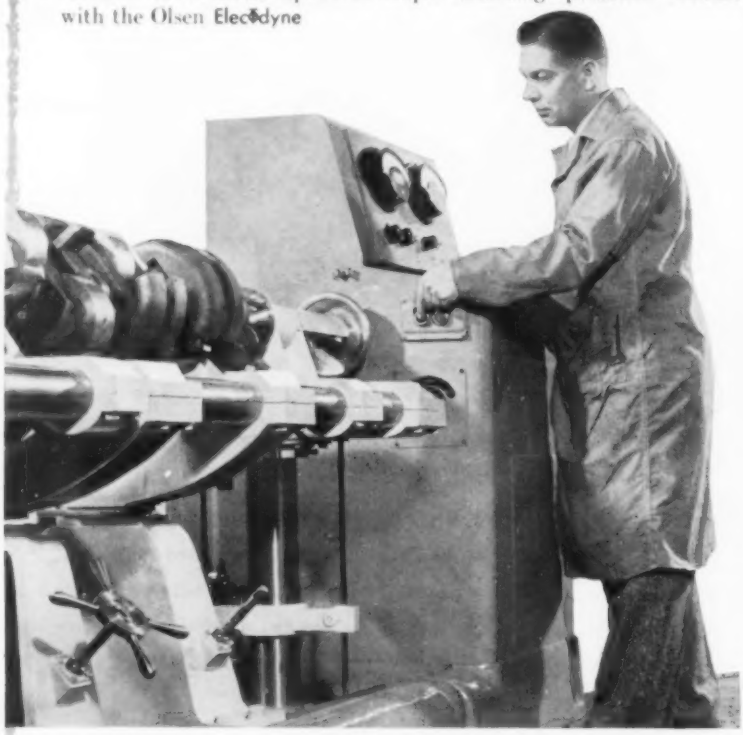
OLSEN

Makes Balancing History!

don't miss Tinius Olsen Electrodyne *automatic* BALANCING MACHINES

AT THE A.S.T.E. SHOW — BOOTH 1213

- See how the exclusive Olsen Electrodyne takes the guesswork out of balancing . . . instantly indicates the amount and angle of unbalance on two large meters. Even minute quantities of unbalance are quickly pinpointed by this highly sensitive electronic indicating system.
- See how unbalance can be corrected—*automatically*—without removing the part from the machine.
- See how convenient, rapid and simple balancing operations become with the Olsen Electrodyne



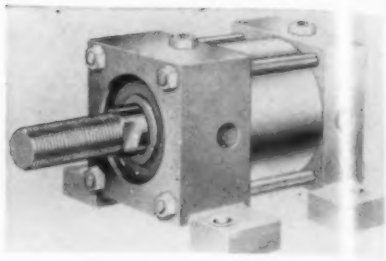
• See the Olsen exhibit in Booth 1213 at the Tool Engineers' Industrial Exposition in Philadelphia, April 26 to 30.

If you can't make the show, write for **Bulletin 49,** *just released, which contains details on the complete line of* **Olsen Electrodyne Balancing Machines.**

TINIUS OLSEN
Testing & Balancing Machines

TINIUS OLSEN TESTING MACHINE CO.
Easton Road · Willow Grove, Pa.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-188



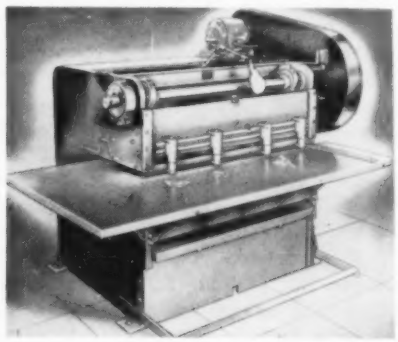
automation cylinders include extra large, hardened piston rods; double porting for extreme high speeds; extra long cushions; interchangeable check and cushion adjustment valves; rolled steel and plates. The design provides minimum mounting and envelope dimensions.

Further information is contained in company's catalog No. 109. **T-4-1881**

Squaring Shear

Economy of time and cost are the outstanding advantages offered by this counter thrust, deep throat squaring shear made by The Manchester Machine Corp., Manchester, Conn. Two models, the 16″ and the 52″ share the same advantages and features.

In production, the shears operate at 120 blade strokes per minute. Part involving straight, outside cuts naturally may be done less expensively than by



die and punch press methods, while scrap and spoiled work is minimized.

Elements available in the shear include a slide assembly which counteracts the rearward thrust caused by the machines' cutting action. The shaft, mounted to the rear of the slide, produces a forward thrust behind the upper blade.

Plungers with Micarta pads to prevent damage to sheets of material, are easily adjusted to any width or gage to be sheared.

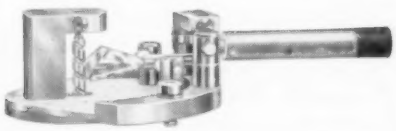
With the deep throats, a 24-inch gap for a 52-inch model and 7½-inch gap for the 16-inch model, makes possible accuracy. Use of the end of the blade for notching may be used for notching with the accuracy as for straight cuts.

T-4-1882

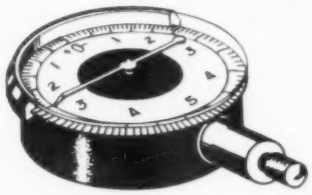
The New
NILCOID
DIAL INDICATOR

RE. PAT. NO. 21934

with the
REVOLUTIONARY NEW
NILCOID MOVEMENT



and . . . STEP DOWN,
POINTER-LINE DIAL



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The World's FINEST!

No gear train . . . Only four moving parts . . . Increased accuracy . . . Lower maintenance . . . Shockproof . . . Lower cost . . . .

WRITE FOR STARTLING DESCRIPTIVE LITERATURE TODAY!

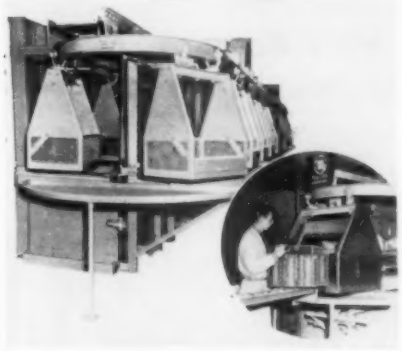
NILSSON
GAGE COMPANY INC.
Poughkeepsie, New York

INDICATE A-4-189-1

Automatic Cleaning Unit

A development in automation for the metalworking industry has been announced by Dept. TTE, The Equipment Div. of the Magnus Chemical Co., Inc., Garwood, N. J. It is a fully automatic multi-stage batch cleaning and processing method, called the Magnus Aja Lif, and consists of a series of independent, self-contained dipping units serviced by an automatic conveyor system.

The dipping, raising, and transfer of the parts from one stage to the following stages is not only fully automatic but in addition the work to be processed



is vigorously agitated up and down in each solution according to a predetermined exposure time program.

Fully automatic, the whole unit is serviced by a single operator.

A timing device makes it possible to vary the processing cycle according to technical requirements. The equipment is air powered minimizing fire hazards.

This versatile equipment can be designed for any number of stages, alkaline or acids, as well as drying operations, requires no special foundation, and can be installed in any existing production line. **T-4-1891**

Die Casting Unit

Introduction of a heavy duty cold chamber type die casting machine is announced by the Harvill Mfg. Co., Corona, Calif.

Called the Model HD-303, the machine is particularly adapted to casting aluminum alloys at high speed from either single or multiple cavity dies. Magnesium and brass are also readily cast with the cold chamber type machine and zinc, lead and tin may also be cast after conversion to the hot chamber operation, Harvill said.

The conversion to the hot chamber may be made with a minimum of delay. Up to 300 complete casting cycles per hour may be obtained.

A high pressure oil hydraulic system supplies the operating and injection power for the unit, with pressure up to

BOOTH 1620—A.S.T.E. SHOW

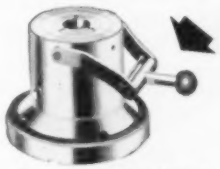
Zagar gearless drillhead, 12", 24-spindle; capacity up to 5/8" steel.

ZAGAR
GEARLESS DRILLHEADS
excel for drilling
on ALL centers

Zagar gearless drillheads can drill practically any number of holes at one pass, up to 600 or more; any material; any pattern; as close as twice the drill diameter; maintain accurate spacing. High production, complete accuracy. Furnished as complete units or adapted to any standard drill press.

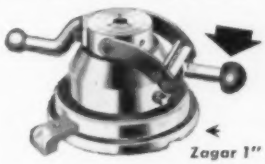
♦ ♦ ♦

Bigger and Better Handles
on ZAGAR Fixtures



Zagar 2" holding fixture.

Zagar 5-C pull type collet.



Zagar 1" indexing fixture.

—plus all the well known advantages of Zagar design; rigid holding, accurate construction, quality finish, and dependability suiting Zagar's 15-year-old standards. Also a complete line of air-operated holding fixtures and collet lathe chucks.

♦ ♦ ♦

ZAGAR TOOL, INC.
24000 LAKELAND BLVD., CLEVELAND 23, O.

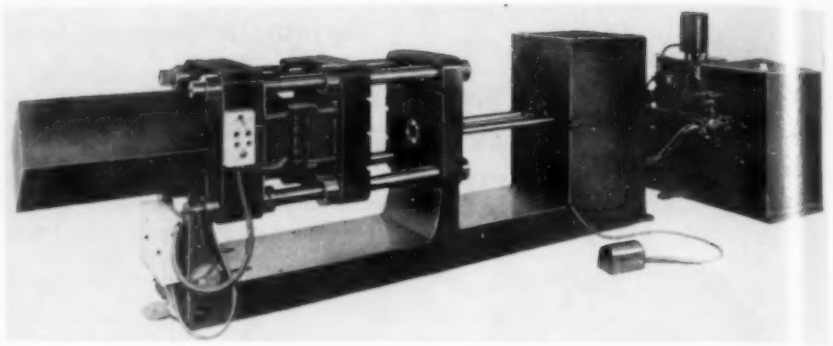
Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

INDICATE A-4-189-2

11,800 psi on the molten metal as it solidifies in the die cavity. The injection assembly and all controls are positioned to afford the operator easy, high speed operation.

Design of the unit permits fast and easy die changes. The tie bars pull back out of the way and the platens are open on all sides, allowing full access. Because of T slots in the platen faces, irregular-shaped dies are easily attached.

A special safety feature prevents molten metal from being injected unless the dies are fully closed and locked under 300 tons of pressure. Dies are closed and held by knuckle joint design. The compound toggle has maximum of compression-bearing area and tiebars are pre-stressed when dies are closed to withstand metal injection pressure of 10,000 psi over a die projected area of 75 square inches.



Cores, which may be operated manually, hydraulically or mechanically, may be pulled in all directions.

All operating components, including the hydraulic system, are easily accessible for maintenance or repair.

The self contained power unit with motor, pump, accumulator, reservoir, and pressure controls is a separate piece of equipment and may be placed in any position with relation to the die clamping part of machine. One large size power unit may be used to operate more than one machine.

The power unit pump is completely unloaded when the pressure setting is reached because it does not pump against a pressure head or relief valve.

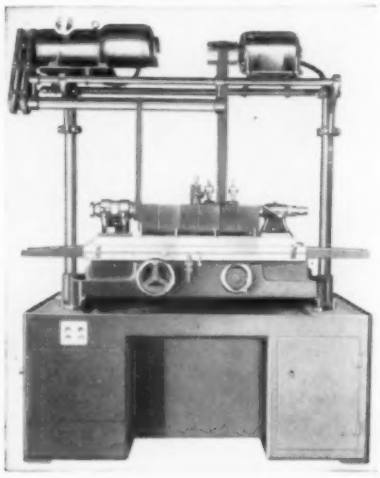
T-4-1901

Your Invitation To Visit Booth 1427
A.S.T.E. Show, Philadelphia, April 26-30

See NEW Model No. 507
Special for Instrument Grinding

- **See Model 811 Cabinet Mounting**
- **See Model 1018 Cabinet Mounting**
- **See Model 612 Surface Grinder**

6" x 12" Full Capacity of Chuck
15" Grinding Height *over* Chuck
Double Taper or Ball Bearing Design Spindles, Temperature Controlled
Superior for Form Grinding



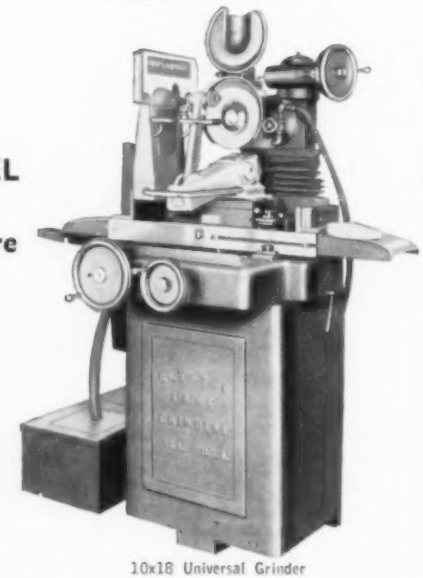
6x12x15 — Surface Grinder

CARBIDES,
SAPPHIRE,
HIGH SPEED STEEL

Your grinding problems are over when you use
Crystal Lake's Finest

Close Tolerances
Mirror Finishes
High Accuracy

"We Recommed the Right Machines for the Right Job"



10x18 Universal Grinder

CRYSTAL LAKE GRINDERS
SINCE 1910
CRYSTAL LAKE, ILLINOIS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-190

Carbides

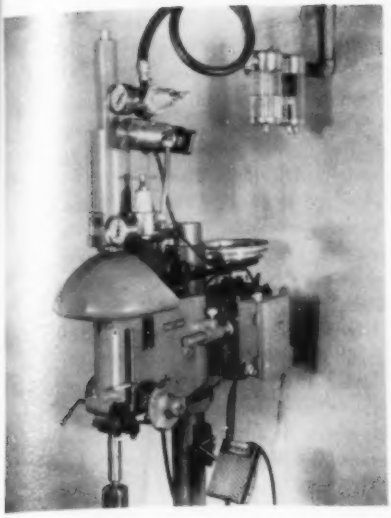
Carboloy Dept. of General Electric Co., Detroit, Mich., has announced availability of its recently introduced cemented carbide grade 370 for heavy-duty steel cutting in a wide range of standard, stocked blanks.

The blanks include styles 1000 and 2000, $\frac{3}{16}$-inch thick and smaller; style 0000 blanks, $\frac{1}{4}$-inch thick and over; style 5000 (pointed nose standards); clamped on blanks, and all inserts not previously announced. **T-4-1902**

Drill Press Feed

Speed is the main feature of the pneumatic power feed units for drill presses now introduced by The Pneuma-Draulic Co., Box 666, Detroit, 6, Mich.

These units, called Rotafeed, attach directly to the drill press spindle, operating on 40-60 psi on the power stroke

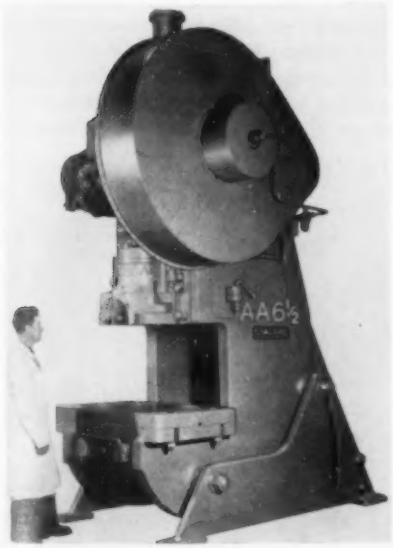


and 10-15 psi on the return stroke. Due to the low pressure used, extra capacity for multiple spindle drilling or tapping is provided. Instantaneous rapid approach and infinitely variable hydraulic feed control with rapid return is provided. Automatic in operation, the Rotafeed is triggered by a momentary contact switch.

The complete Rotafeed package includes two pressure regulators with high and low pressure gages, solenoid operated 4-way valve, automatic control box, pancake-type momentary contact switch, ¼-inch Filter-Lube unit and rubber hose with fittings. Bulletin R-4 contains complete details of the feed. **T-4-1911**

OBI Presses

Unusual developments are incorporated in the new line of open back inclinable presses, Series AA, recently introduced by Niagara Machine & Tool Works. Each press is equipped



A COMPLETE MACHINE SHOP IN ONE MACHINE

Over 50 DIFFERENT OPERATIONS

each set-up as a single purpose machine

centreless grinding · high speed routing · turret & second operation · disk filing · tool grinding · surface grinding · cutter grinding · jig boring · slotting · end milling · horizontal milling · vertical milling · and many others

The RINDIS sets up in minutes for almost any precision machine operation. Right speed for every job: 64 to 2700 r.p.m.

Individual accessory units make each set-up a single purpose machine. Rugged, dependable RINDIS stays on job without costly maintenance. Saves costly production line delays and set-ups.

THE MOST USEFUL MACHINE TOOL YOU HAVE EVER SEEN

machine shops • maintenance shops • tool rooms • experimental & development labs • mobile workshops • model shops • training.

Write today for full information

Distributors' inquiries invited

NEWAGE RINDIS
a complete machine shop

NEWAGE INTERNATIONAL, INC. • 235 E. 42 ST., NEW YORK, N.Y.
NEWAGE (CANADA) LIMITED, 1174 BAY STREET, TORONTO, ONTARIO

Distributor's Inquiries Invited

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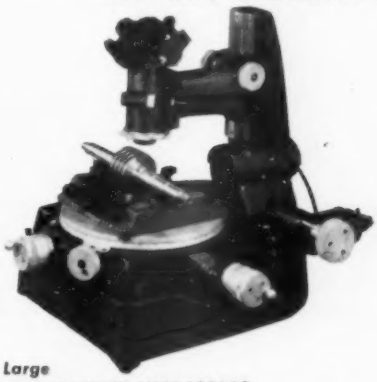
CARL ZEISS JENA

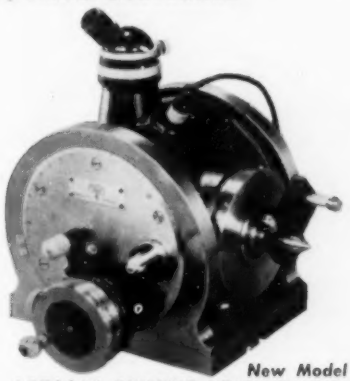
PRECISION INSTRUMENTS

for the most exacting requirements in Modern Tool Engineering and Production

See them at BOOTH 131, ASTE Convention



Large
TOOLMAKER'S MICROSCOPE
Now available in inch system as well as metric. Magnification to 50X. Measuring range 2" x 6". Angular range 360 degrees. Interchangeable ocular head with dial templets of standard screw thread profiles and similar figures.



New Model
OPTICAL DIVISING HEAD—Precision scale reading to 10 sec. of arc. Special presetting device. Sturdy construction—usable on a surface grinder or miller under heavy strain. Reinforced spindle. Precision spindle bearings. Improved microscope for convenient reading in any spindle position.

ALSO . . . Indicating micrometers • Passometers • Orthotest • Optical Bevel Protractors • Optimeters • Universal Measuring Microscopes • Magnifiers • Loupes—and other current products of the world-famous Carl Zeiss Optical Works of Jena, Germany.

For further information on these and other Carl Zeiss instruments, consult your dealer, or write to . . .

ERCONA CORP. *Scientific Instrument Division* 527 Fifth Ave., New York 17, N.Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-191-2

with Niagara electropneumatic clutch, which is electrically controlled and air actuated. This clutch combines the prime advantages of both friction and mechanical sleeve clutches. Assuring positive drive, it may be engaged or disengaged at any point in the stroke. There are no friction members to slip, heat up or wear. It can be single stroked, jogged or run continuously and, as a safety feature, stops automatically if power or air pressure fails.

Utilized for blanking, forming, drawing, perforating and in combination die and automatic feeding operations, Niagara OBI presses may be fed from either side or from front or back. Work can be discharged through the opening in the bed or the opening in the back.

Available in 8 sizes with shaft diameters ranging from 3 to 7½ inches, Niagara Series AA OBI presses can be arranged to meet individual requirements.

Detailed information and specifications may be obtained by requesting Bulletin 57-A from the manufacturer, 683 Northland Ave., Buffalo 11, N. Y.

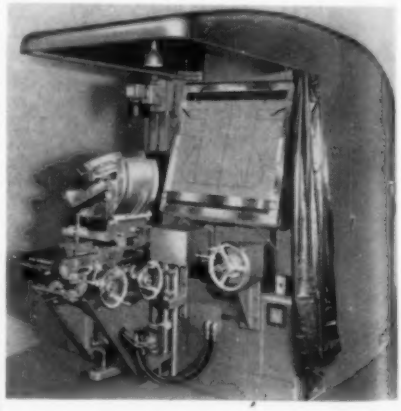
T-4-1921

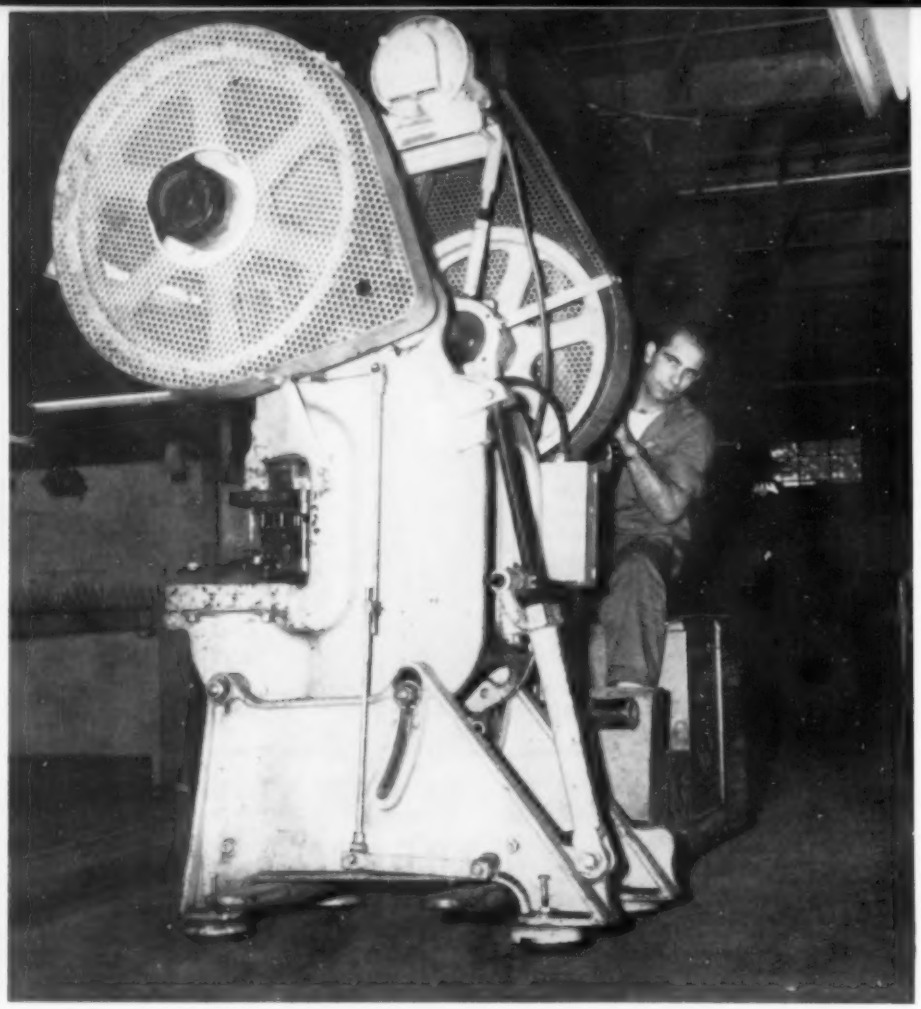
USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Comparator

The Jones & Lamson Machine Co., 160 Clinton St., Springfield, Vt., has added to its line of optical comparators a unit that will inspect slot contour, angular locations, and spacing on gas turbine disks from 12 to 36 inches diameter.

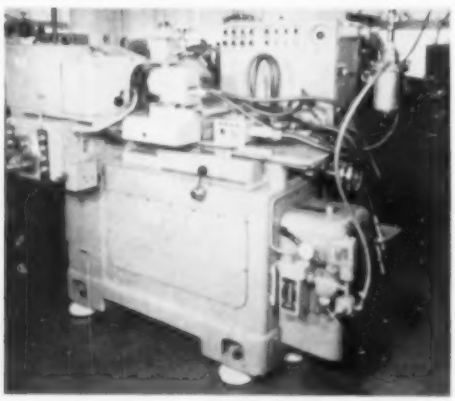
For operator convenience, the receiving screen is located at one side of the workholding fixture and positioned vertically at eye level, and all controls are within easy reach. Vertical travel of the worktable is hydraulically operated with a Servo mechanism which gives finger tip control. The 30 x 30 inch receiving screen is of sufficient size to permit the use of projection lenses of suitable area to encompass





NO LAGGING MADE THIS PRESS "MOBILE." This 45-ton Perkins punch press was moved 200 feet — and was out of production only 5 minutes, because it was on Leveling Barrymounts.

MACHINERY THAT MOVES WITH THE TIMES CUTS COSTS



GRINDER ACCURACY PROTECTED. Leveling Barrymounts protect this Heald Size-Matic from external shock while grinding the inner races of miniature precision ball-bearings to within tenths of thousandths of an inch.

Your product costs can be cut because mobile machinery offers you flexible production layouts. Machine maintenance and reject costs are cut because damaging external shocks are isolated. Installation costs are cut because requirements for certain foundations are eliminated—no lag bolts to set or shims to drive, yet machines will not walk.

Write *today* for the story of MACHINES THAT MOVE WITH THE TIMES

A.S.T.E. INDUSTRIAL EXPOSITION — BOOTH 2171

THE BARRY CORP.

1928 PLEASANT STREET
WATERTOWN 72, MASS.

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

mo[illegible]ots at magnifications of 31.25 or 50 [illegible]s size.

T[illegible] staging fixture with suitable sine bar [illegible]rangement is rigidly constructed for [illegible]pporting heavy disks, and provides an accurate means for tilting the disk up to 50 degrees either right or left for slot angle, and up to 15 degrees for face angle of slot to the axis of the disk.

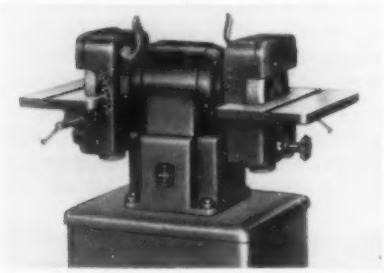
Slot spacing measurement is accomplished with a graduated ring and vernier. Any inaccuracies in slot spacing are indicated by the relationship of the shadow of the slot to the chart outline. **T-4-1931**

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Carbide Tool Grinder

Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo, Mich., is introducing a 6-inch carbide tool grinder for dry operation. The unit, known as the Model D-6, incorporates several important features of the larger 10 and 14-inch Hammond machines.

Among these are the patented safety cup disk, which completely fills the open cup of the wheel and prevents hand injuries and dropping a tool into the cup of the wheel. The unit is equipped with exhaust type wheel guards, while the tables adjust in and



out by means of screw feed to compensate for wheel wear. The table of the machine, which has a cored self-cleaning slot, is easily set between 30 deg above to 30 deg below horizontal where it may be quickly locked with a single lever. Under each wheel is an exhaust outlet which may be connected to a dust collecting system.

The unit provides a further advantage in that two operators can grind tools at the same time with freedom of movement and unobstructed vision.

A brake on each end provides handy quick stopping when reversing.

A corresponding unit from the same company is the Model WD-6 for dry grinding.

Complete information on both units is available in the company's Carbide Grinder Catalog. **T-4-1932**

Squaring Shears

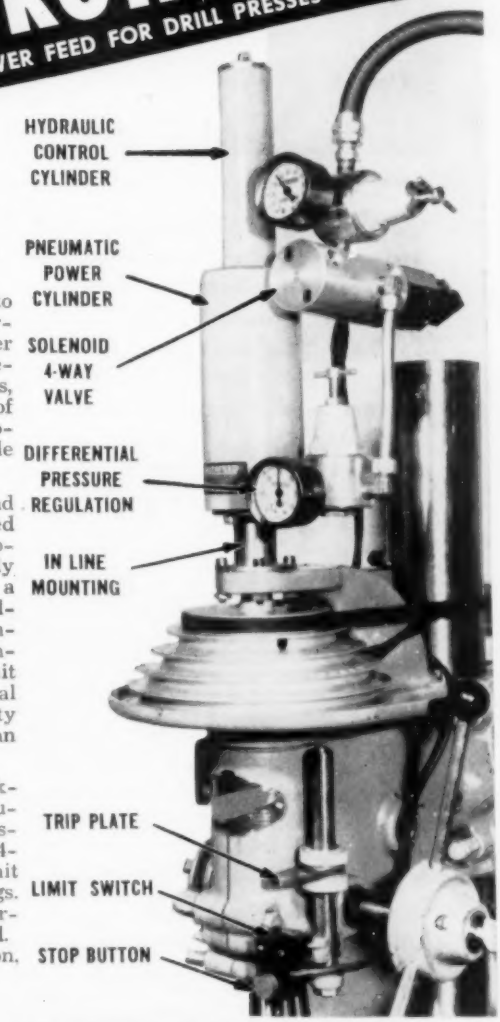
A redesigned squaring shear line expanded to 18 models available in 8 power-driven, 6 foot and 4 air types has been announced by the Famco Machine Co., Kenosha, Wis. Capacities range from 20 to 14 gage mild steel in 22 to 72-inch sheet widths. Special knives are available for plastics and paper shearing.

Two important features of the line are: completely reversible 4-edged alloy steel knives providing four times the cutting life of single-edged knives and all-steel bed and upper knife frame of box-type construction made especially to eliminate undesirable spring action.

The Famco foot shear line is built to cut 16 and 18 gage mild steel in 36, 42 and 52-inch widths, and 18 gage in 22, 30 and 72-inch widths. They are of box table and frame construction. A convenient steel treadle extends the length of shear, reinforced by steel torsion bar to prevent twisting.

The air shears cut 16 gage mild steel

Here it is—
THE NEW REVOLUTIONARY ROTAFEED
AUTOMATIC POWER FEED FOR DRILL PRESSES



THE WORLD'S FASTEST POWER FEED FOR DRILL PRESSES

ROTAFEED attaches directly to the drill press spindle and operates on 40-60 psi on the power stroke and 10-15 psi on the return stroke. These low pressures, in addition to saving millions of cubic feet of air annually, provide extra capacity for multiple spindle drilling or tapping.

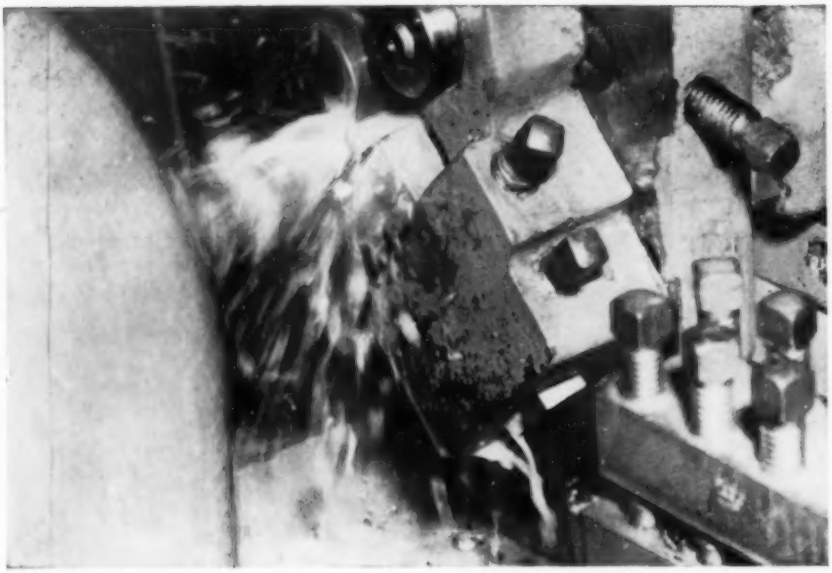
Instantaneous rapid approach and infinitely variable hydraulic feed control with rapid return is provided. The unit is completely automatic, being triggered by a momentary contact switch. Cylinders are precision honed seamless steel tubing attractively finished in orange enamel. The unit is guaranteed against mechanical failure. It has a proven capacity to drill more holes per hour than any other power feed unit.

The complete ROTAFEED package includes two pressure regulators with high and low pressure gauges, solenoid operated 4-way valve, ¼" Filter-Lube unit and rubber hose with fittings. Complete installation and operating instructions are furnished. For more detailed information, send for bulletin No. R-4

ROTAFEED OPERATES ON LOW PRESSURE (40-60 psi) AND WILL DRILL MORE HOLES PER HR. THAN ANY OTHER DRILL PRESS FEED
Let us prove this to you in Booth 2007 A.S.T.E. Industrial Exposition

PNEUMA-DRAULIC CO. • BOX 666 DETROIT 6, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-193



Even if water-soluble oil coolants were free ... you could still afford to buy *Lusol*

Because Lusol dissipates heat so fast, tools work cooler . . . stay sharp longer. You can increase machine speeds and feeds, get greater production per machine and use fewer tools to do it. It's been proved! Lusol allows tool savings and production increases that more than make up your coolant costs.

Water is the answer! Lusol *conditions* water—the best cooling agent—and makes it suitable as a machine coolant. Lusol is a lubricant, a cleaner, a rust preventive and a germicide. It contains no oil, so it won't smoke even at breakneck machine speeds.

Cutoff saws and milling cutters stay sharp longer . . .

Expensive replacement is reduced by keeping milling cutters and saws supercool. Working with Lusol lengthens their cutting life even at highest speeds.

Metal-turning machines increase production . . .

Machine operators can boost production . . . really hog metal with Lusol on the job. Yet tools, work and chips stay cool. Working areas stay cleaner, without smelly cutting oil spattering on floors and workers' clothing.

Grinding operations require less down time . . .

Wheels stay clean, hence run longer between dressings. Lusol's detergent action cleans wheels as it cools. Machines, too, stay clean.

Data Available. Write for *Lusol Gets to the Point* describing actual case histories where Lusol has increased production from 50% to 500%. This booklet also discusses Lusol's anti-weldant and cleaning properties, plus its ability to prevent irritation to workers' skin.

F. E. ANDERSON OIL COMPANY

Box 213-O, Portland, Connecticut

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-194

in 36, 42, 52 and 72-inch widths.

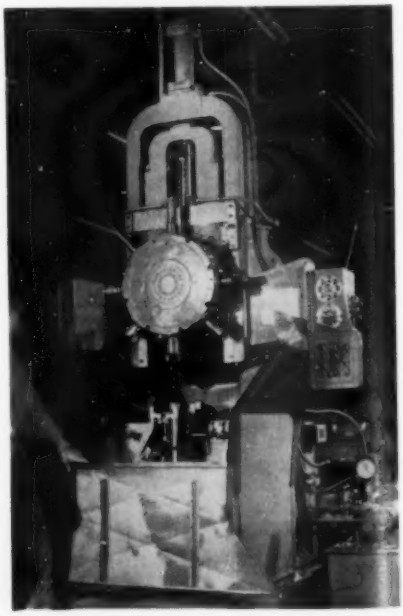
The power-driven shear line features the fast acting Electromatic clutch, which is an instant action, electrically controlled 9-point jaw clutch. Four models with this clutch mechanism shear 14 and 16 gage mild steel, in 36, 42, 52 and 72-inch widths. Four other power driven shears with Electromatic clutch only, shear 18 and 20 gage mild steel in these same widths. Standard equipment for power-driven shears includes: front, back and side gages, holddown, movable electric foot switch, Textolite gibs, 4-edged knives, motor and magnetic starter. **T-4-1941**

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Turret Drills

An 8-spindle turret drill, the Model 3BH, and a 6-spindle unit, the Model 2BH, are being displayed at the ASTE tool show by Burg Tool Mfg. Co. Both models are fully automatic, hydraulic turret drills.

Several important features are incorporated in their design. They offer rapid approach, infinitely variable pre-



sel[illegible] feeds, pre-selective spindle sp[illegible] skip indexing and precision de[illegible] control.

[illegible]e same time, these rigidly con-st[illegible]d drills demand little main-te[illegible]e, are operated through simple co[illegible]ls, and will machine to close tol-er[illegible]s.

[illegible] another Burg unit, the Burg-m[illegible] Model 2B, will be shown for the fi[illegible] time at the Philadelphia show. It [illegible] a manually operated 6-spindle, au[illegible]matic indexing turret drill with pre-sel[illegible]tive spindle speeds.

More information on all three units may be had from the company, 3743 Durango Ave., Los Angeles 34, Calif.

T-4-1951

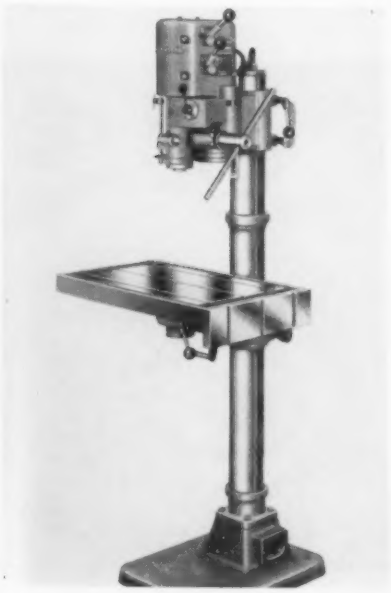
Geared-Head Drill Press

Production of a completely gear-driven drilling machine has been announced by the I. O. Johansson Co., Skokie, Ill.

Practical and time saving features include provision for fast speed changes accomplished by a simple shift of gear levers, even while machine is running. Spindle construction, with lower bearing located at the nose, gives support where most necessary to assure spindle rigidly and accuracy.

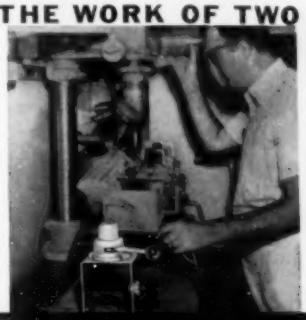
Quick tool changes are possible through use of the patented, built-in drill ejector, which ejects drill automatically, even while spindle is rotating, requiring no drift or hammer.

For precision depth drilling and counterboring, the machine is equipped with two stops. One stop on the left side of the head offers fine adjustment to the correct depth, while a positive stop on the right side insures mainte-

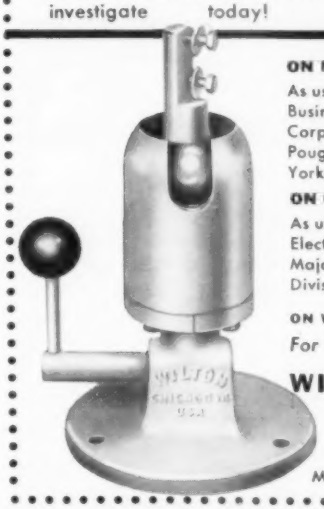


Wilton's PowRarm

HELPS ONE MAN DO THE WORK OF TWO



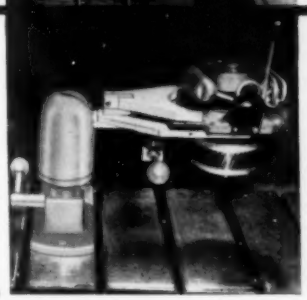
You'll discover—as have the nation's most important manufacturing firms—that the Wilton PowRarm saves time, cuts costs, reduces worker fatigue. There's a PowRarm work positioner for every job—investigate today!



Model No. 301

ON MACHINES
As used by International Business Machines Corporation, Poughkeepsie, New York, plant.

ON CONVEYORS
As used by General Electric Company's Major Appliance Division, Erie Works.



ON WORKBENCHES TOO

For full details, just send this ad in with your letterhead.

WILTON TOOL MANUFACTURING CO. INC.
941 Wrightwood Avenue,
Chicago 14, Illinois TE-4

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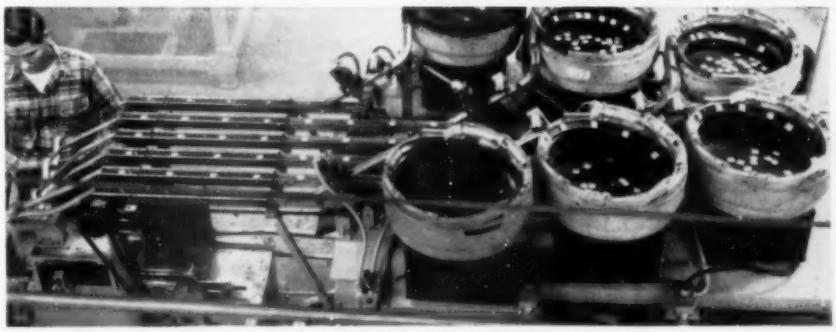
"Short-Cut" To Economical Production



Six Syntron Feeders supplying ceramic wafers to circuit printer in automatic assembly of electronic equipment.

SYNTRON PARTS FEEDERS

. . . single line—automatic feeding of small parts in oriented position

Positive, finger-tip control of feeding rates plus ability to handle small parts of nearly any material or shape enable Syntron Parts Feeders to cut production costs and increase capacities of countless automatic processing installations. Electromagnetic—no mechanical wearing parts—easy to install.

Don't miss Syntron's Booth No. 1960

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ASTE AMERICAN SOCIETY OF TOOL ENGINEERS
1954 INDUSTRIAL EXPOSITION
PHILADELPHIA CONVENTION CENTER
APRIL 26-30 incl.

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SYNTRON COMPANY
340 Lexington Ave. Homer City, Pa.

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NEW BIG CATALOG

NOBLE & STANTON STANDARD

JIG & FIXTURE COMPONENTS

Finest Quality Standards for Your Tooling Program at New Low Prices!

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150 DRAWINGS

Hundreds of new sizes and parts. Many exclusive items not available elsewhere. Advanced engineering features.

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STANDARD PARTS CO.

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Please send your NEW CATALOG of Standard Jig and Fixture Components

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

INDICATE A-4-196

nance of the original setting.

The entire head can be swiveled 360 degrees around the column and securely locked in any position by the turn of one handle. This speeds and simplifies hole location for the operator. The head can also be raised or lowered through a distance of 5¾ inches by turning a crank to the left of the machine.

The machined and accurately ground column is a casting with heavy walls and extra internal ribbing.

To locate a variety of work, the 15 x 24-inch table has three standard ½ inch T-slots on the top, and one side surface.

In addition, the table can be rotated on its own axis, and the entire assembly and its support arm can be rotated around the column. By turning a crank on the left side of the machine, table can be easily raised or lowered and one turn of a handle securely locks the entire unit in the position desired. A trough and outlet for coolant return is also provided.

Eight spindle speeds from 125 to 1540 rpm are provided through the selective gear box and 1 hp motor. The #3 Morse taper spindle has a travel of 4½ inches and drills to a center of 18-inch circle. With a drilling capacity of 1 inch in steel, the maximum distance spindle to table is 34 inches, spindle to base 49 inches. **T-4-1961**

High-Speed Broaching Machine

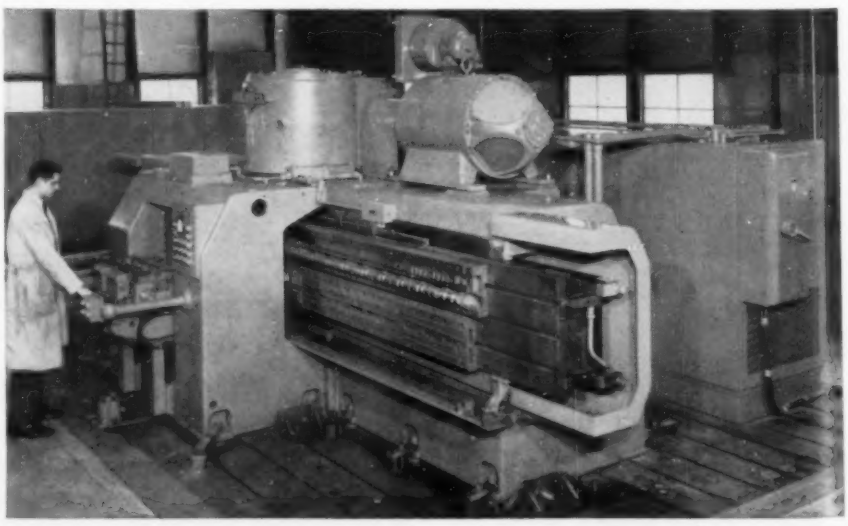
A standard high-speed double-acting mechanical drive, electrically controlled broaching machine with hydraulically actuated fixture, designed for a wide range of broaching operations is announced by Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich. The 25-ton machine, Model HM-25-130, has a maximum stroke of 130 inches.

Ram speed is infinitely variable from 30 to 150 sfm in both directions. Both the ram speed and the length of stroke can be increased to meet higher requirements for specific broaching operations. A jog control panel is provided for use in setup and tryout.

Width of the ram is 24 inches. All electrical and hydraulic equipment is installed in accordance with JIC standards. Automatic pressure lubrication is used throughout. Hardened and ground ways assure highest standards of cutting accuracy.

Floor space requirements for the machine are 194 by 290 inches, including all cabinets and motor-generator set. Over-all height is 96 inches and gross weight is approximately 80,000 pounds. Drive for the ram is supplied by a direct current motor rated at 150 hp at 750 rpm. The motor is coupled to an 18-inch center distance, 20:1 ratio, Cone-Drive double-enveloping worm gear set driving a precision ground helical pinion which in turn drives a rack to provide ultrasmooth, high-capacity drive for the ram. The machine is capable of developing a peak of 300 hp.

The unit illustrated is broaching close-grained cast iron bearing cap clusters at a speed of 142 surface feet per minute. Carbide insert broaches cutting on both the initial and return stroke remove stock from two bearing cap clusters. Metal is removed at a rate of 3¼ pounds per cycle with the depth of cut varying from $\frac{5}{32}$ to $\frac{3}{16}$ inch. Time for each cycle is 21 seconds to permit a normal production of 210 clusters (each consisting of five bearings) per hour. **T-4-1962**

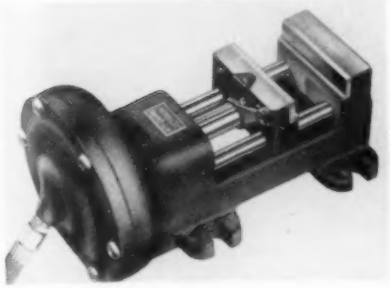


Air Vise

...rich Tools, Inc., Racine, Wis., ...ices addition of a Model 33 air ... the company line.

...ping with a force 15 times air ...ressure, the 3-inch width vise jaw ...nitely adjustable to a maximum ...g of 3⅛ inch, with maximum ... of ⅜ inch. It operates from ... air line or compressor at a max... operating pressure of 150 psi. ... air regulator accessory permits ... ranging from a feather light ... to a rugged squeeze.

Control by a foot pedal leaves operator's hands free for rapid insertion or removal of workpieces in drilling,

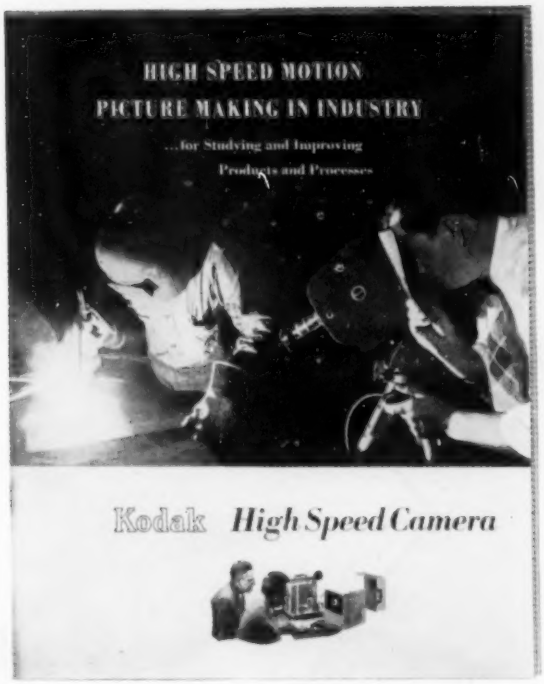


reaming, tapping, sawing, filing, light milling or grinding. The pedal keeps vise jaws open or closed without constant foot pressure. The vise is fast and easy to set with simple, ratchet-operated, triple-thread adjusting screw locked by set screw on top of movable jaw. Hold-down lugs permit secure attachment to bench or machine.

Wide clearance design between jaws permits drilling clear through without interference. Sliding jaw is mounted on two hardened and ground parallel bars to maintain perfect jaw alignment. The vise is equipped with one set of removable soft steel recessed parallel false jaws. Straight jaws are also available. **T-4-1971**

Press Unit

Different design approach is incorporated in the Power-Di press unit for punching, forming and related operations requiring up to 1-ton capacity. This equipment avoids need for die sets in even the most accurate operations, by providing a means of mounting punches and dies of any shape in register blocks that are automatically and accurately aligned in opposing ram and bolster members. The mounting blocks are furnished as part of the Power-Di unit and can be used with various punch and die combinations. More information on this press is available from its maker, Swanson Tool and Machine Products, Inc., 816 E. 8th St., Erie, Pa. **T-4-1972**



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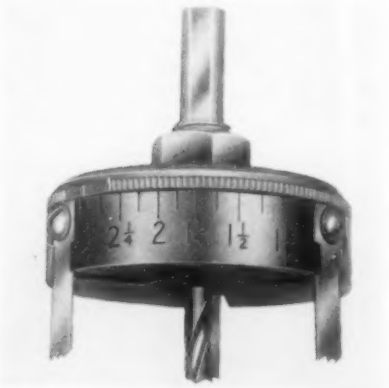
Adjustable Hole Saw

An adjustable tool known as the Erwood dial saw, for cutting holes in metals, wood plastics and other materials is offered by Erwood, Inc. 1700 Berteau Ave., Chicago 13, Ill. Blades are mounted for radial adjustment for cutting holes of any size from 1 ⅛ to 2½ inches by simply setting the easily read dial to the desired size.

The tool will hold any size setting



until changed. It may be used with any portable drill, drill press, lathe, milling machine or any power tool using ¼ to ⅜-inch chuck.

Three sets of interchangeable, high-speed steel cutting blades are included, one each for cutting steel, nonferrous metals and wood.

Complete tool includes a pilot drill, 3/16 inch and three sets of replaceable blades. **T-4-1981**

Heavy Duty Limit Switch

Loxswitch, a heavy duty limit switch with unusual electrical, mechanical and maintenance features, has been made available by R. B. Denison Mfg. Co., 4220 Hough Ave., Cleveland 3, Ohio. Interchangeable with most existing installations and original equipment designs, the Loxswitch Series L100 is a single-pole double-throw double-break switch, with a trigger-type mechanism that provides unusually fast and accurate break. Repetitive accuracy is within 0.03 deg, an accuracy without necessity of lubrication.

Solid silver contact bars, weighing only 1/10 oz, are the only floating components. Carried in a balanced rotor, they are locked in each closed position under 10 oz spring pressure.

Even though contact pressure is more than twice that of most limit switches previously manufactured, operating pressure is only 45 inch oz, without return spring, and 185 inch oz with return spring and full overtravel. This

operating pressure, in addition to ...nced rotor, graphite bronze bear... ...d second outboard shaft bear... ...sults in unusually long mechani... ...s. In operation, without use of ...vel, Loxswitch has passed 25,... ...0 actuations; with 20 deg over... ...operating at 182 times a minute, ...ions exceeded 20,000,000.

...ign of the switch has been so as to ...plify all maintenance problems.

T-4-1991

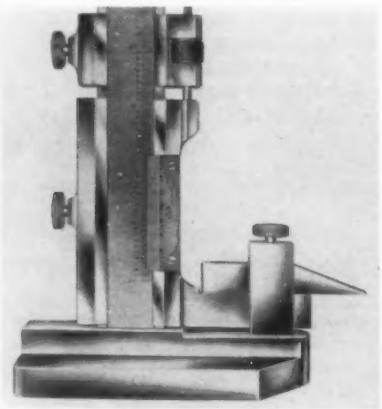
USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Height Gages

Stainless steel height gages with chrome-plated graduations are being marketed by Foster Supplies Co., 6122 Milwaukee Ave., Chicago 30, Ill.

Most important feature of chrome plated gages is that graduations and figures stand out clearly against the dull chrome background, making them easy to read, and they cause no glare.

The Foster chrome-plated height gage has a completely hardened beam. The large 1.225 inch adjustable vernier is also made of chrome-plated stainless steel, which is impervious to acid or rust. A longer slide, larger base and heavier beam insure greater accuracy and dependable stability. **T-4-1992**

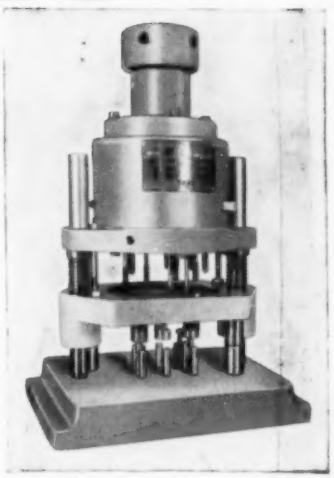


Automatic Nut Runner

An automatic multiple nut runner has been designed by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. At the touch of a button the tool shifts into position, locates the sockets on the nuts, and tightens them—all in a matter of seconds. The nut-runner can be built for any number of nuts in any pattern desired. When installed and set, it provides a completely automatic packaged unit for simultaneously running a number of nuts in the time ordi-

At Booth 1620, A.S.T.E. Show, see Zagar Standardized Self-clamping DRILL JIGS

Zagar Drill Jigs are used in conjunction with Zagar gearless multiple-spindle drill heads to ream, drill and tap on standard drill presses and tapping machines.



▲ Zagar 15-spindle, 7" diameter gearless drill head mounted on Zagar standardized drill jig drills 15 holes in aircraft part.

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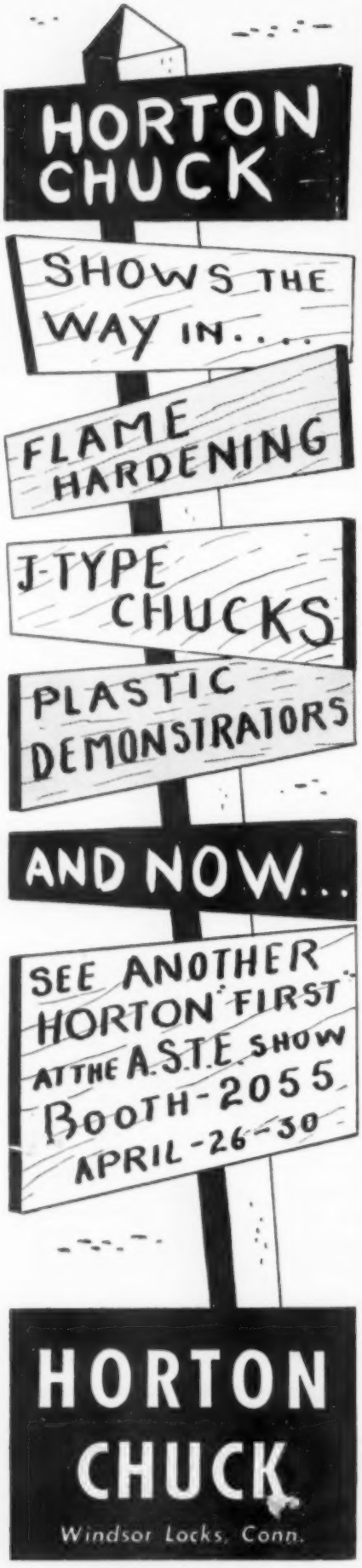

INDICATE A-4-200-1

narily required to run a single nut. Nuts are run to a predetermined stall, giving uniform torque and quality control.

They can be used for such applications as the assembly of automotive engines, transmissions, and differentials, as well as the manufacture of machine tools, electrical appliances, furniture, aircraft engines, and any other products requiring the setting and tightening of multiple nuts. **T-4-2001**

Heavy-Duty Hand Grinder

Designed for grinding and milling, the Dumore Series 35 hand grinder utilizes a ¼-hp continuous-duty-rated universal motor that delivers speeds up to 35,000 rpm. It is available for 115 v or 230 v dc or ac, 0-60 cycle operation with ⅛ or ¼-inch collet chuck.

The Series 35 can be used with tungsten carbide mills, high-speed cutters, mounted wheels and points or abrasive

bands, for grinding, milling, finishing, and polishing materials ranging from wood to hard alloy steel. Over-all length including chuck is 10¾ inches; the body diameter is 2 7/16 inches; while small diameter is 1 5/16 inches. Weight is slightly more than three pounds.

Highest quality parts machined to close tolerances are used throughout. Three microprecision bearings are seated in steel inserts cast right into grinder housing.

For details, write The Dumore Co., 1300 Seventeenth St., Racine, Wis.

T-4-2002

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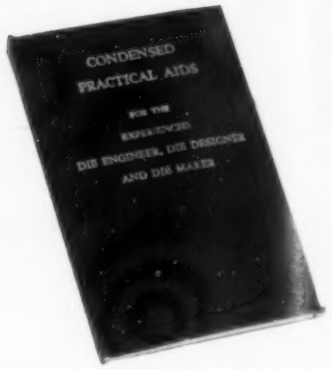

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TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-4-16	The American Tool Works Co.	**Radial Drills**—Bulletin No. 327 tells of advantages and features of "Hole Wizard Radial." (Page 16)
A-4-299	Barnes Drill Co.	**Coolant Separators**—Bulletin B3005 tells of features of new "Kleenal Magnetic Filter." (Page 298-299)
A-4-393	W. F. & John Barnes Co.	**Special Machines & Equipment**—Booklet "Coordinated Machine Engineering" describes modern machines and mass production techniques. (Page 392-393)
A-4-192	The Barry Corp.	**Movable Machinery**—Bulletin "Machines That Move with the Times" points out advantages of flexible production layouts and lower machine maintenance costs. (Page 192)
A-4-236	Chicago Tramrail Corp.	**Storage Systems**—Booklet "STAK-MOR" explains economic advantages and increased storage space with this system. (Page 236)
A-4-29	The Cincinnati Shaper Co.	**Internal Shapers**—Catalog N-6 discusses difficult internal shaping jobs accomplished with Cincinnati's internal shaper. (Page 28-29)
A-4-197	Eastman Kodak Co.	**High-Speed Movies**—New booklet "High-Speed Motion Picture Making in Industry" shows how to use high-speed movies to study and improve products and processes. (Page 197)
A-4-366	Fellows Gear Shaper Co.	**Gear Shapers**—Booklet "The Art of Generating with a Reciprocating Tool" discusses techniques of gear shaping. (Page 366)
A-4-281	The Gaertner Scientific Corp.	**Toolmakers' Microscope**—Fully illustrated bulletin No. 147-50 tells the complete story of these microscopes. (Page 281)
A-4-453	The Gear Grinding Machine Co.	**Gear Grinding Machines**—Complete line of machines by Geargrind is described and illustrated in the new 8-page catalog. (Page 453)
A-4-240	George Gorton Machine Co.	**Pantographs**—Bulletins 1655-2604 give complete information about the Gorton line pantographs. (Page 240)

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A-4-487	Kearney & Trecker Corp. Special Machinery Div.	**Special Machines**—Booklet gives details on the facilities and engineering services offered by Special Machinery Division. (Page 486-487)
A-4-230	Master Mfg. Co.	**Machine Tool Attachments**—New 80-page Pictorial Operational Book explains and describes various attachments. (Page 230)
A-4-367	The Nebel Machine Tool Co.	**Nebel Lathes**—New bulletins describe the 16-inch and 20-inch "LA" engine and gap lathes. (Page 367)
A-4-321	Nice Ball Bearing Co.	**Ball Bearings**—Catalog No. 150 discusses types and sizes of ball bearings. (Page 321)
A-4-32	C. A. Norgren Co.	**Lubricant Attachments**—New folder No. 491 gives complete data on coolant systems. (Page 32)
A-4-391	The OK Tool Co., Inc.	**Carbide Milling Cutters**—Catalog 13 entitled "Modern Milling Cutters for Modern Milling Machines" discusses multiple diameter milling with carbide. (Page 390-391)
A-4-332	The Osborn Mfg. Co.	**Deburring and Finishing Machines**—Booklets on automatic deburring and Brushamatic Machines describe these operations. (Page 332)
A-4-193	Pneuma-Draulic Co.	**Hydraulic Drill Press Feeds**—Bulletin R-4 discusses the nomenclature operation of automatic feeds on drill presses. (Page 193)
A-4-221	The Sentry Co.	**Electric Furnaces**—Catalog R-45 illustrates and describes all sizes of Models Y and YP furnaces. (Page 221)
A-4-243	The S-P Mfg. Corp.	**Heavy-Duty Air Cylinders**—S-T Automation Cylinders are described in Catalog 109; Catalog 102 discusses S-P standard Air Cylinders. (Page 243)
A-4-188	Tinius Olsen Testing Machine Co.	**Automatic Balancing Machines**—New bulletin 49 contains details on the complete line of Olsen balancing machines. (Page 188)
A-4-330	The Torrington Co.	**Rotary Swagers**—Booklet on swaging contains complete descriptions of Torrington rotary swagers. (Page 330)

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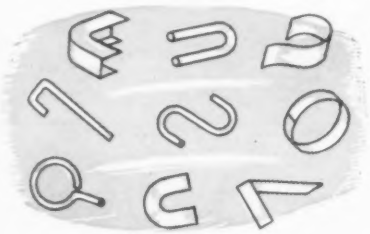

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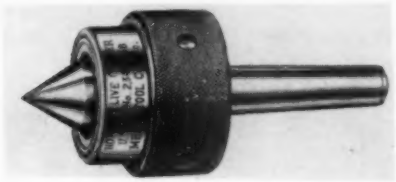
LAKE CITY, MINN.

INDICATE A-4-203-1

Live Centers

Howard live centers featuring back-up ring to assure positive rigidity are offered by The Melin Tool Co., 3372 W. 140th St., Cleveland 11, Ohio. In design of these centers, the ring backs up against face of the quill, transferring rigidity of the quill to the head of the center. This reduces the spring in the



body of the center at a ratio of four to one. This additional strength reduces the danger of the live center following the work and helps eliminate run-out. Thus, in effect, this live center has the rigidity of a dead center.

Matched ball bearings, mounted in tandem in the head and oil impregnated bronze bearing in the tail of the shank, permit greater thrust and radial loads at higher speed.

All models and sizes of the Howard live center have full length solid spindles. **T-4-2031**

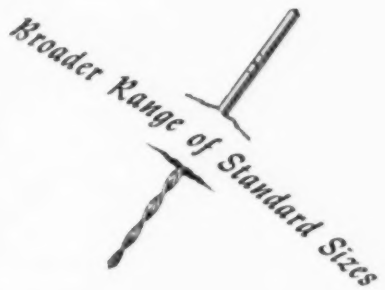
Internal Thread Gage

Fast, accurate, economical visual gaging of all forms and classes of internal threads are the features designed into the internal thread comparator being introduced at the ASTE Industrial Exposition by Whitney Chain Co., 237 Hamilton St., Hartford 2, Conn.

Threaded parts in diameters ranging from $\frac{3}{8}$ to $1\frac{1}{2}$ inches, can be gaged at the inspector's bench, beside the machine or on the machine at the rate of 20 or more pieces per minute.

This inspection tool indicator tells at a glance whether parts are oversize,

L&I *Reamers give you more*



L&I

The Reamer Specialists

LAVALLEE & IDE, INC.
CHICOPEE, MASS.

INDICATE A-4-203-2

undersize, tapered, or if accumulated lead and angle error are within established tolerances. Because of its easily read visual indicator design, the comparator provides means for classifying tapped holes within very close limits.

All classes of fit, American Standard or Unified Threads, can be checked with a simple adjustment of the indicator tolerance hands. One thread segment is collapsible, permitting fast loading. Ball-bearing, single slide design insures maintained accuracy over long service life. Easily removable thread segments permit interchangeability and fast setup. **T-4-2041**

Lead Screw Tapping Head

A complete lead screw tapping head that enables unskilled help to produce precision threads on any drill press has been announced by Automatic Methods, Inc.

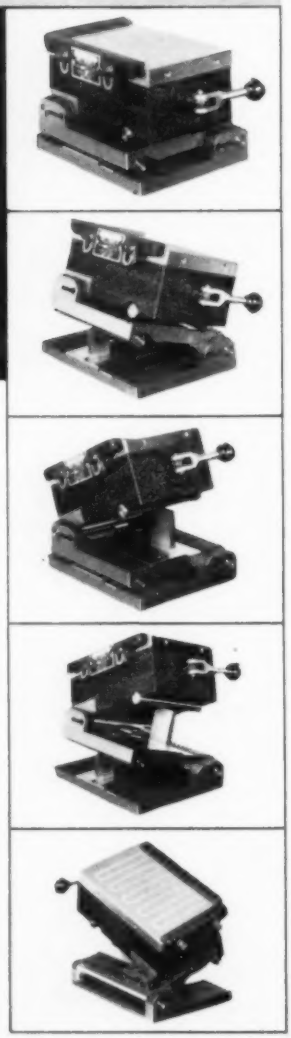
Primarily, the Auto-tap head features a rapidly interchangeable lead screw, an unusual cone clutch reversing mechanism, and positive depth control to assure perfect threads even in blind or recessed holes. Since the tap withdraws faster, the floating workpiece is positioned rapidly, and operator fatigue is reduced, higher production is promised. Tap breakage and work spoilage are reduced because the mechanism is actuated before the tap engages the work and the lead screw guides the tap in and out of the work. There is no load on the tap other than normal cutting load. Thus thread misalignment caused by downward or upward pressure exerted by the operator is prevented.

A Jacobs Rubberflex collet and nut aligns the tap which is driven positively by a floating lock assembly. The tapping head may be attached to the quill of any drill press and can be adapted for semi or fully automatic precision tapping.

Two Auto-tap head models are available for tapping #0 to 5/16 inch and #10/32 to 3/4-inch threads. Details and prices may be requested from the manufacturer, Automatic Methods, Inc., Div. 204, 965 W. Grand St., Elizabeth, N. J. **T-4-2042**

Industry's most versatile Magnetic Chuck

MAGNA-SINE



Here is a magnetic chuck that not only handles your parallel work but angular work, too. And angular set-ups to gauge block accuracy take but a matter of minutes!

Any angle—single or compound—is set up by inserting gauge blocks between the Magna-Sine's precision hinged base plates. Correct blocks to use are indicated in Table of Constants provided. Hours of set-up time are saved, angular accuracy is positive, work is held distortion-free on permanent magnet chuck.

Thousands in use for grinding, inspection, drilling, boring.
Write for free catalog which shows all styles and sizes . . . price list included.

OMER E. Robbins COMPANY
Dept. E, 5722 TWELFTH STREET • DETROIT 8, MICHIGAN

Also producers of special gauges and fixtures

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-204

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Deburring Machine

Removal of burrs from both sides of the holes at the rate of 600 to 3000 holes per hour is possible with the semi-automatic deburring machine announced by Model Machine Co., 4729 Hawthorne St., Philadelphia 24, Pa. This Model A deburring machine uses standard countersink type deburring tools. Spindles rotate in opposite directions giving an equalized cutting action. The capacity of the machine is 6 inches between chucks and it will take up to a 1-inch diameter hole.

Workholding fixtures are not necessary as operator merely inserts part, depresses foot control valve pedal and the machine automatically deburrs both sides of the hole simultaneously leaving hands free for loading. Setup time is

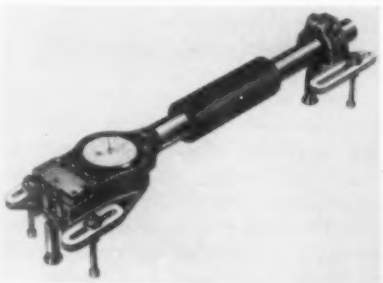
reduced to a minimum as the machine can be changed from one workpiece to another within three minutes.

The machine is equipped with the air controls for infinite cycling and speed control and the pressure required to operate the machine is only 5 to 40 pounds with a minimum air consumption. The machine is driven by a ⅓ hp. 115-120 volts, single phase, capacitator motor, and equipped with a variable speed drive. **T-4-2051**

ID-OD Gage

Federal Products Corp., 1144 Eddy St., Providence, R. I. has introduced a universal ID-OD gage, designed especially for gaging shallow bores and shoulder diameters.

Designated as Model 88 P-10, the gage features easy adjustment to suit specific diameter requirements. Locat-

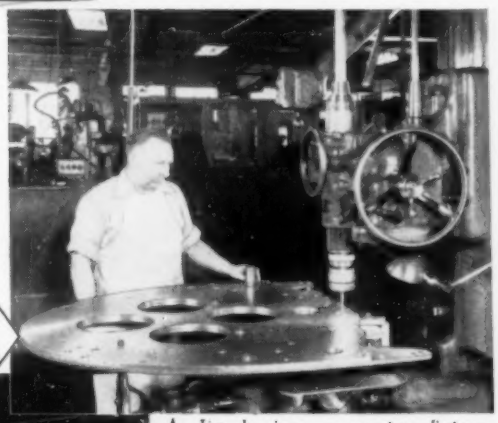


ing buttons can be adjusted for height so as to locate the measuring contacts at the desired elevation. Its tubular frame is light in weight and easy to handle. Rigid construction assures a high degree of accuracy while lack of overhanging extension posts or exposed indicator spindles also helps to keep the gage accurate. Measurement is transferred through a sensitive pantograph unit to the dial indicator, where it can be easily and quickly observed.

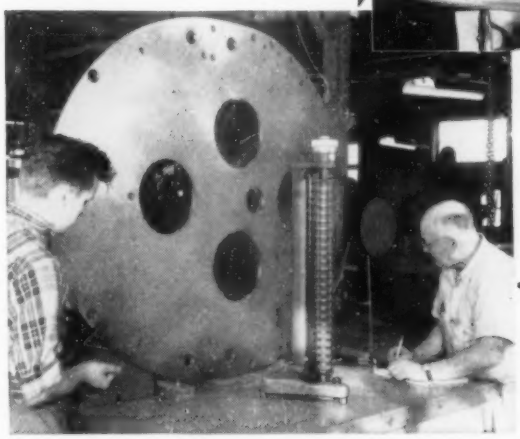
The gage can vary in length from six to forty-two inches, in three-inch incre-

Contract Jig Boring

What B. Jahn Can Do For You!



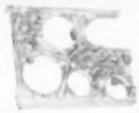
Single jig boring projects such as this jet aircraft fixture.

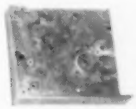


Jig boring a master fixture section for jet aircraft. Bushings were fitted to multiple holes with tolerances accurate to .0005".

Final inspection of one of four fixture sections for jet aircraft. This master fixture measures 18 feet when fully assembled.

Production jig boring projects such as thousands of these precision components.





Or this seemingly impossible assignment: To bore over 148 different size holes at different angles, holding rigid relative tolerances into precision alloy castings, completed value of which, was over $5000 each.

Engineers are relying on B. Jahn every day to lick their *real tough* problems. Investigate the facilities at B. Jahn. 16 of the latest jig borers, every size, manned by master toolmakers and piloted by the best engineering brains available.

Investigate B. Jahn and Invest in Production Economy!

SEND FOR FACILITY LIST AND LITERATURE — REQUESTS FOR QUOTATIONS WILL BE HANDLED PROMPTLY

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

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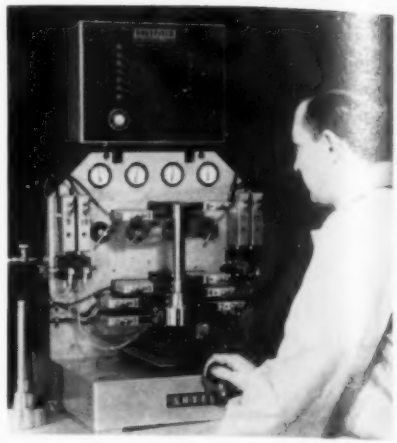
ments. Although each gage is furnished for a particular diameter measurement at a specific depth, adjustments are possible. Vertical adjustments can be made by moving the adjustable rest buttons to place the contacts at different depths, up to one inch. Reference contact can be moved along the length of the tube to measure smaller diameters than specified. Although primarily a stock gage, the installment can be made in lengths between the three-inch increments normally furnished if a particular application requires an exact tube length. **T-4-2061**

13-Point Inspection Unit

Inspection rate of 600 to 800 parts per hour at 100 percent efficiency is the work turnout for a gage developed by The Sheffield Corp., Dayton, Ohio. The device inspects 13 dimensions simultaneously on a rear planetary carrier assembly, and indicates by means of colored electric lights whether or not the 13 dimensions are within tolerance, oversize, or undersize. Dimensions checked with unit, known as the Multichek, include two locations on four outside diameters, the inside



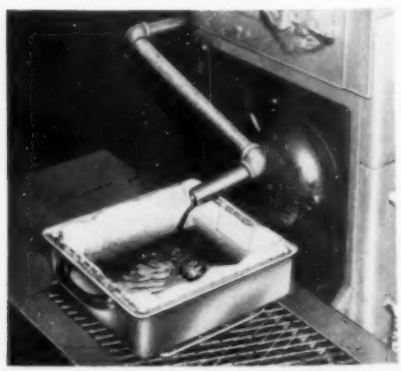
depth at four places and outside height of the base. The instrument is set up with maximum and minimum masters.

The operator places the part on the positioning fixture and slides it forward into gaging position. When all of the dimensions are within tolerance, the master light at the base of the light panel remains white and the 13 signal lights black out. However, if one or more dimensions are out of tolerance, the master light shows red and the signal lights indicate the faulty dimensions by becoming red for undersize or green for oversize. Lights of all correct dimensions black out. **T-4-2062**

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Filter for Low Coolant Flow

Delpark Junior, a positive action filter for low coolant flow offers several important advantages: continuous positive filtration removes abrasive solids from the coolant as it comes from the work. As a consequence, considerable savings are effected in meeting rigid tolerances and finishes, in greater production through machine efficiency and fewer rejects. Longer



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with the NEWEST DEVELOPMENT in . . .

Hitch Feeds!

New 2½" Model K Hitch Feed

FIRST

NO OTHER FEED — AT ANY PRICE — OFFERS ALL THESE PRODUCTION INCREASING ADVANTAGES!

NEW MEEHANITE CASTINGS
Massive frame of virtually indestructible meehanite makes the new Model K the strongest hitch feed ever built.

LONGER FEED LENGTH
Extra frame strength allows full 2½" feed length on stock up to 5" in width.

CARBIDE GRIPPER PLATES
Carbide gripper and wear plates are standard on this new, rugged, versatile feed.

A great, new addition to the Dependable Dickerman line — a feed that will outlast almost any die — trouble free, accurate — day in — day out operation speeds production and actually cuts parts cost up to 60%.

Send for LITERATURE and CATALOGS on the complete line of Dickerman MONEY-MAKING FEEDS.

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H. E. DICKERMAN MFG. CO.

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wheel and tool life is possible through the elimination of frequent wheel dressing. Cutting tool life is extended.

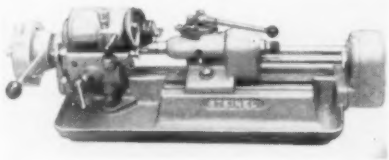
Servicing is a simple matter. A woven wire basket holds the disposable filter tray. When a tray becomes so filled with swarf that it will no longer take the flow of coolant, it is easily removed and replaced with a new one. The unit comes complete with combination mounting bracket and clean coolant return line or, if preferred, a connection is available for separate pipe or hose.

For further information write to Industrial Filtration Co., Dept. 298, Lebanon, Ind. **T-4-2071**

Burnishing Machine

Morey Machinery Co., Inc., has introduced the Steinel Pivot Burnishing Machine for the finishing of bearing surfaces on spindles, pivot shafts, drive journals, etc. to insure proper size and improve surface quality.

This machine comes in two models—SR2n which takes work from 0.019 to 0.078-inch diameter; and model SR3n



with minimum and maximum of 0.039 to 0.314-inch diameter.

Burnishing can be performed with tool steel or tungsten carbide disks, the principal difference is that the tool steel disk will remove metal faster due to its rougher surface; the tungsten carbide disk is slower in operation but gives a better finish.

More details are available by contacting Morey Machinery Co., Inc., 383 Lafayette St., New York 3, N. Y.

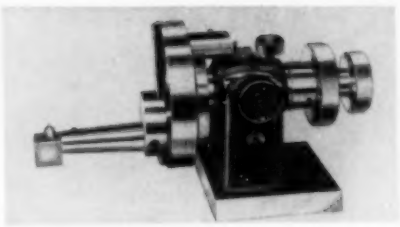
T-4-2072

Wheel Dresser

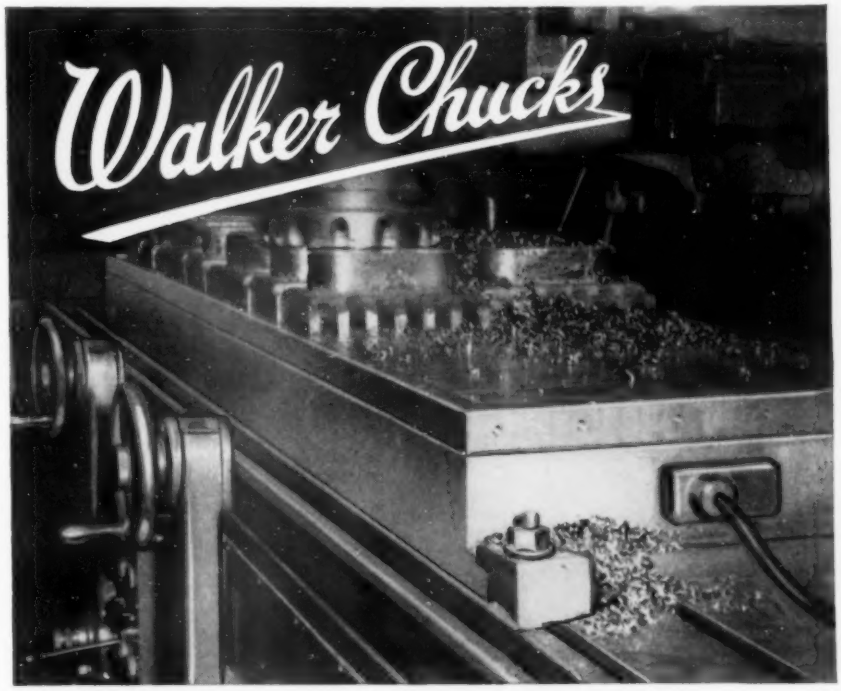
Last Word Sales Co., 18500 Mt. Elliott, Detroit 34, Mich., has announced a line of wheel dressers engineered for precision performance in a broad range of work. Three models are included in the line.

Model A, with a 3.400 center height, dresses any angle tangent to a radius and permits dressing at the base of the wheel, or point of contact. This feature allows use of the wheel guard and dust collector during the dressing operation. Model B, designed to fit smaller surface grinders, will dress a radius and any two tangent angles in one operation. It will dress male radii to 1 inch and female radii to 2 inches, with tangent angles to $\frac{3}{4}$-inch maximum length, on wheels up to 7 inches in diameter.

Model C, a compound wheel dresser, illustrated, incorporates a tilting feature designed to compensate for compound angles involved in grinding form tools. Where flat or dovetail form tools are concerned, this dresser is set up in the horizontal position to the radius and angles to be produced on the part. By tilting the dresser to an



angle equal to the sum of the clearance and rake angles on the form tool, and then dressing the wheel, compensation is made for the compound angles normally involved. **T-4-2073**



WALKER special magnetically controlled chuck eliminates magnetization of tool and machine

The unusual feature of this outstanding advance is chip control in milling and planing operations. This powerful special chuck holds for intermittent cuts on rough steel castings using approximately 50% of the available contact area between work and chuck face. Another notable O. S. Walker accomplishment.

Hold Everything with Walker Chucks

O. S. WALKER CO. Inc.

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Original Designers and Builders of Magnetic Chucks

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The

Complete

LOVEJOY LINE of Modern Metal Cutting Tools

The Lovejoy line of inserted-tooth type cutting tools has never been more complete — or offered so many features. Every tool has been designed to give maximum production with a minimum of down time for sharpening. Lovejoy tools feature the *exclusive* "Positive-Locking" device that assures rigidity even during heavy intermittent cuts — making them rugged as solid tools. Their housings — of husky forged steel — are designed for longest life.

Lovejoy H. S. S., Carbide and Cast Alloy Blades are interchangeable in the same housing and are stocked for immediate shipment.

For standard or special cutters, call on Lovejoy — suppliers to the world's leading manufacturers for over 35 years. Write today for Catalog No. 28 which describes the full line of Lovejoy tools.

"Speed & Feed Calculator" free on request

131 MAIN ST., SPRINGFIELD, VERMONT

LOVEJOY TOOL COMPANY, INC.

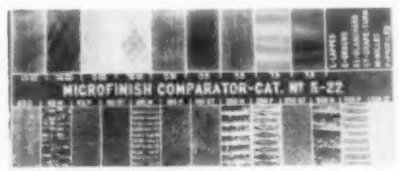
Vibratory Feeder

The Detroit Power Screwdriver Co., 2801 W. Fort St., Detroit 16, Mich., announces the DPS bowl feeder. Based on the vibrating principle, this device provides fully automatic, oriented, single-line feeding to grinding, packaging, inspecting and other automatic machines and operations.

Primarily, the feeding unit is designed to handle parts that normally could not withstand tumbling, such as finished ground parts and fragile pieces. **T-4-2081**

Microfinish Comparator

Engineers, purchasing agents, designers, inspectors, machinists, and quality control supervisors are offered an accurate, economical comparator for typical machined surfaces in this S22 Microfinish Comparator. Each comparator has 22 different established, flat-surface roughness specimens used for visual and tactual comparisons ranging from 2 to 500 microinches, and



conforming to ASA standards. Extreme accuracy in each comparator is obtained by the electro-forming process which, using a single precision-machined master, assures uniformity of each specimen and avoids any variations.

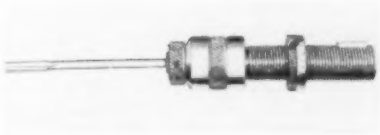
Placed alongside machined work, this Microfinish Comparator, by eye or by touch, provides a quick and positive comparison for quality and workmanship.

Made of corrosion-resistant nickel packaged in a sturdy leather pocket case. The manufacturer is Baptist Machine Co., Ludlow St., Stamford, Conn. **T-4-2082**

Floating Holders

[illegible] easy replacement of tools, plus tru[illegible] powerful collet action on taps and rea[illegible]s is now possible with the JT loc[illegible]nd-eject type floating holder an-no[illegible]ed by Scully-Jones and Co., 1901 S. [illegible]kwell St., Chicago 8, Ill.

The holder, designed chiefly to compensate for misalignment between tool and work on multiple-spindle operations, is said to eliminate the use of a drill when ejecting tools. Four-split chucks for taps and two-split chucks for reamers are locked and ejected by means of a new threaded nut (revolving on ball bearings on nose of holder), which engages a thread on the end of



the chuck. By rotating the threaded nut clockwise, the chuck is drawn into the holder and compressed evenly and tightly on the shank of the tool. Chuck is quickly ejected by turning the lock and eject nut until threads are entirely disengaged. Floating mechanism is of the proved and much used double-gear spline drive design, providing unrestricted float. This balanced and flexible drive design prevents binding and avoids dead spots, a cause of inaccurate piece parts. **T-4-2091**

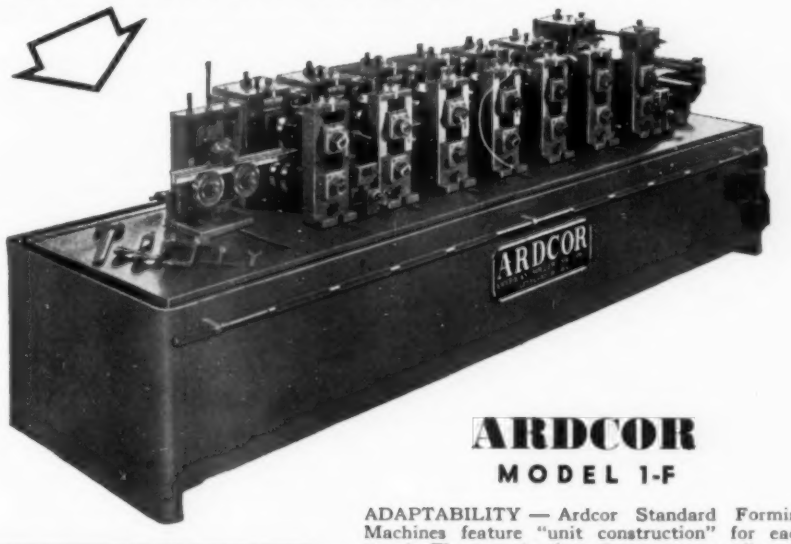
Indexing Units

Turret indexing units, designed to serve as basic intermittent-motion chassis for special automatic machines for a variety of manufacturing operations on small and medium parts, are offered by Swanson Tool and Machine Products, Inc., 816 E. 8th St., Erie, Pa. Available in a wide range of turret diameters, number of work stations and dwell times, they are also offered in clutch-operated models which permit infinite dwell times at the option of the operator. Adaptation of the turret indexing unit is the turret turntable. It is a constant speed turntable, and is provided with or without rotating spindles at an optional number of work stations. These units are part of Swanson's exhibit at the ASTE Exposition. **T-4-2092**

Small Brakes, Clutches

Unusual design and operating principle have been incorporated in the small, compact, electric brakes, clutches and clutch-couplings by Warner Electric Brake & Clutch Co., Beloit, Wis. These replaceable face electric brakes and stationary field electric clutches, which provide fast, accurate control of low-torque drives offer several advantages for a wide variety of power transmission applications. High-speed engagement and release, coupled

The Production-WISE
ROLL FORMING MACHINE...



ARDCOR
MODEL 1-F

Spindle Diameter	1½"
Roll Diameter	4¼" to 7"
Horizontal Distance Between Spindles	12"
Roll Space on Standard Machine	10"
Capacity Max.	.072

ADAPTABILITY — Ardcor Standard Forming Machines feature "unit construction" for each stand. Thus production changes are easily and quickly made. With this feature, any length base can be furnished to accommodate additional units as required.
Ardcor Roll Forming machines embody the precision, accuracy and stability found only in the highest grade machine tools. In addition, Ardcor offers a completely engineered installation—cradle reels, roll forming machines, roller dies, flying cut-off fixtures, etc.—from one qualified source.
Likely as not your special shapes can be ideally handled by a standard Ardcor machine. Your inquiry is invited—without obligation.

Also Standard Machines up to 4½" Spindle Diameter

American ROLLER DIE CORPORATION
29540 Clayton • Wickliffe, Ohio

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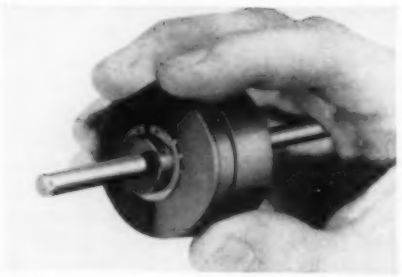
with unusually high torques make the units adaptable to starting, stopping, indexing, rapid cycling, synchronizing, torque limiting, indexing and jogging and single revolution cycling applications on small, electrically operated instruments and machinery. Pushbutton or automatic operation with limit switches, relays, electric eyes, and other electric controls makes possible design opportunities heretofore limited by slow, costly mechanical linkages plus size and weight requirements, according to the manufacturer.

The brakes have just two parts, a rotating armature and a stationary field with replaceable face, while the clutches and clutch-couplings have only three working parts, a stationary field, rotor and armature. All units operate on 6 to 15 watts of direct current.



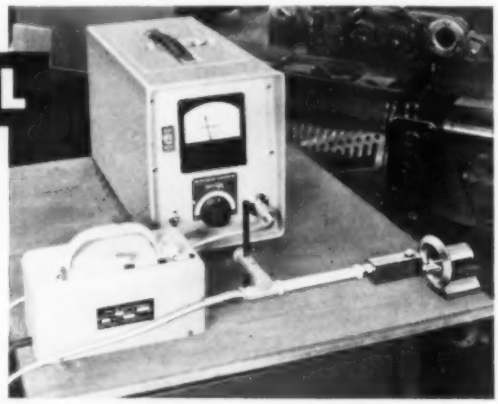
The flux pattern for the clutch is shown below. When the clutch field coil is energized, flux flows from the field to the rotor, which attracts the armature for coupled driving. Brake flux pattern is the same except the stationary field attracts the rotaing armature for insantaneous stopping. With special controls, response time measured in milliseconds are possible.

Voltage is easily adjusted by means of rheostats giving a wide selection of acceleration and deceleration rates. Torque build-up is always smooth until lock in after engagement is positive with no creeping or slipping. Torque ratings are from 8 to 240 inch lb.

Units require from 1⅜ to 2$^{9}/_{32}$ inch axial space for mounting. **T-4-2101**

SHOP TOOL

for measuring surface roughness . .



The PROFILOMETER

★ Measures practically ALL surfaces, external and internal — including surfaces that cannot be measured with a hand-held Tracer.

★ Used in thousands of production departments — *at the machines,* or wherever most convenient.

★ Rugged; portable; simple to use. No special care, skill or experience required.

★ Dependable — and tamper-proof. No sensitivity adjustment. No calibration by the operator.

★ Gives ARITHMETICAL or R.M.S. average-roughness readings, in microinches, as selected by switch on panel.

★ Sold and serviced by *specialists* in surface measurement . . . since 1936.

FREE BULLETIN LT89

gives details — shows typical applications. WRITE for it. And see the Profilometer in use at BOOTH 229, ASTE Industrial Exposition.

Profilometer is a registered trade mark.

MICROMETRICAL MANUFACTURING COMPANY

345 S. MAIN ST. • ANN ARBOR 10, MICH.

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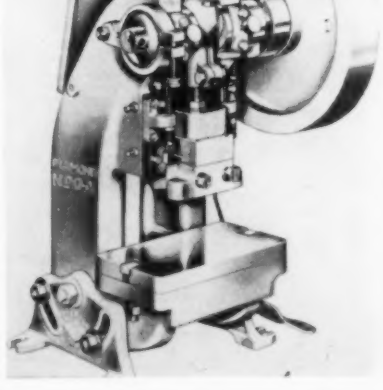
USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

9-ton Punch Press

A number of important features have been included in the redesigning of the Diamond 9-ton bench punch press to rigid specification of SR-4 strain gage analysis. Using Meehanite castings, this press will now meet stricter safety codes throughout the country. The special features now include interchangeability of parts, large projected crankshaft bearing areas to minimize friction loss, and precision ground V gibs.

Precision engineered with a toggle design nonrepeat trip mechanism this press has a die height of 7 inches, intermittent capacity of 11 tons, ram area 4¼ x 5 inches, and bed area 6½ x 12 inches. Standard stroke is ½ to 3 inches with special strokes available



up order. The press is made in plain op belt with 150 strokes per minute an back geared to 100 strokes per mi e. Motor recommended is ¾ hp wi motor and motor drive arrange- me extra. Net weight is 520 lb and ov all height is 34 inches. A catalog is available upon request to the manufacturer, Diamond Machine Tool Co., 511 Coffman-Pico Rd., Pico (Los Angeles), Calif. **T-4-2111**

Check on Screw Data

The Screw-Chek'r (and screw shear), a device for checking small screws with fine threads for length, body size, thread count, tap series, body drill, tap drill as well as giving basic outside diameter if mechanic wishes to make the screw, has been developed by Holloday Tool Research.

It combines features which make it practical as a screw holder, cutter, thread or body straightener and screw alteration tool. It covers 11 sizes from No. 1 to 5/16 inclusive in 32 thread combinations.

The Screw-Shear is used in combination with the hardened and threaded plate making it possible to cleanly shear screws up to No. 8, flush to the front of the Screw-Chek'r. Actually, it is a complete chart of screw information. Complete instructions are deeply engraved in the steel on the back of the plate for permanent reference.

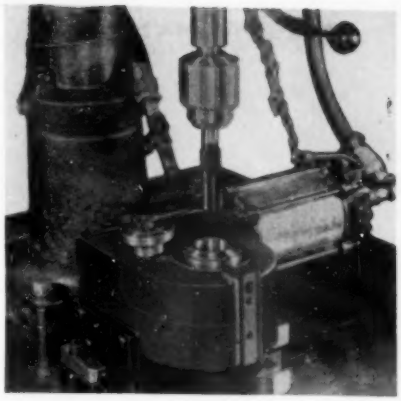
Literature on the tool is available from Dept. 84 of the company, 7430 N. Hurst St., Portland 3, Ore. **T-4-2112**

Air-Operated Chuck

Lynair, Inc., Jackson, Mich., announces an unusual type air-operated collet chuck, actuated by means of a heavy-duty air cylinder through a gear train. Important feature of the design is that the collet is held stationary in position at all times. This is accomplished by means of a lock-ring in the bottom of the fixture. The collet is opened and closed by means of a separate sleeve on the outside of the collet. When the collet is once closed on the workpiece, it will not release even though air pressure failure may occur, thus permitting the machining to be completed. Since the collet remains stationary in position at all times, user is assured of controlled depth on all parts.

Yet another advantage is in the fact that positive holding of the lightest plastic to the heaviest steel or cast iron part is done without damage to the outside surface.

The Lynair collet chuck is completely self-contained and can be mounted in either a horizontal or vertical position.

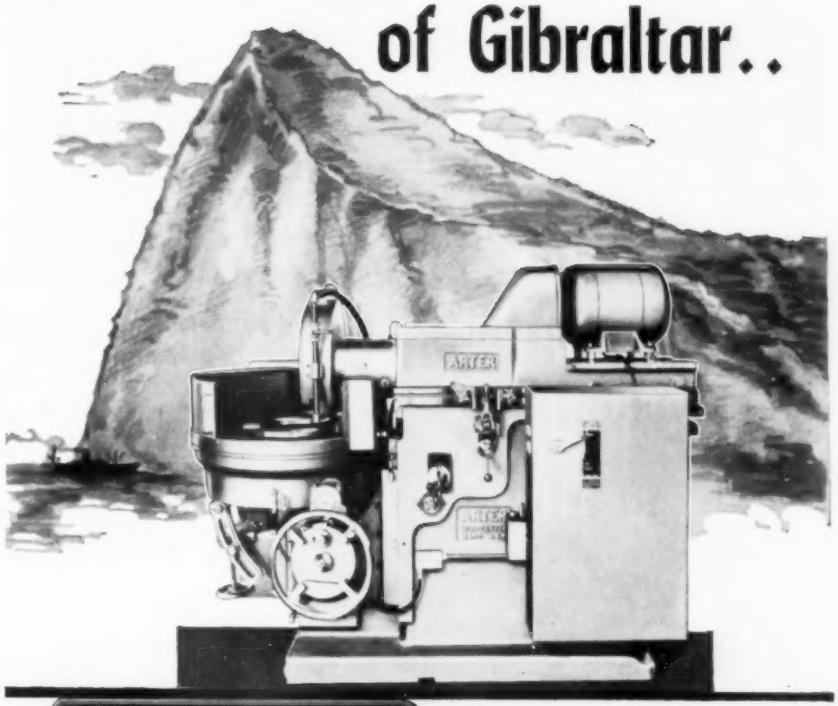


It can also be furnished with an expanding type collet to hold on the ID of a part, permitting machining operations on the outside.

Capacity ranges from 1/16 through 3¾ inches. Stock diameter up to 1⅜ inches can be passed through collet.

Opening and closing of the collet is extremely fast—in many cases an operator can handle two or more units, such as drill, chafer and tap on a three spindle setup. **T-4-2113**

Like the Rock of Gibraltar..



ARTER Rugged Dependability

This trademark on your grinder means rugged dependability has been built in. For precision down to the last tenth, you will find ARTER always reliable. ARTER engineers have solved hundreds of trying grinding problems. They can solve yours.

ARTER GRINDING MACHINE COMPANY

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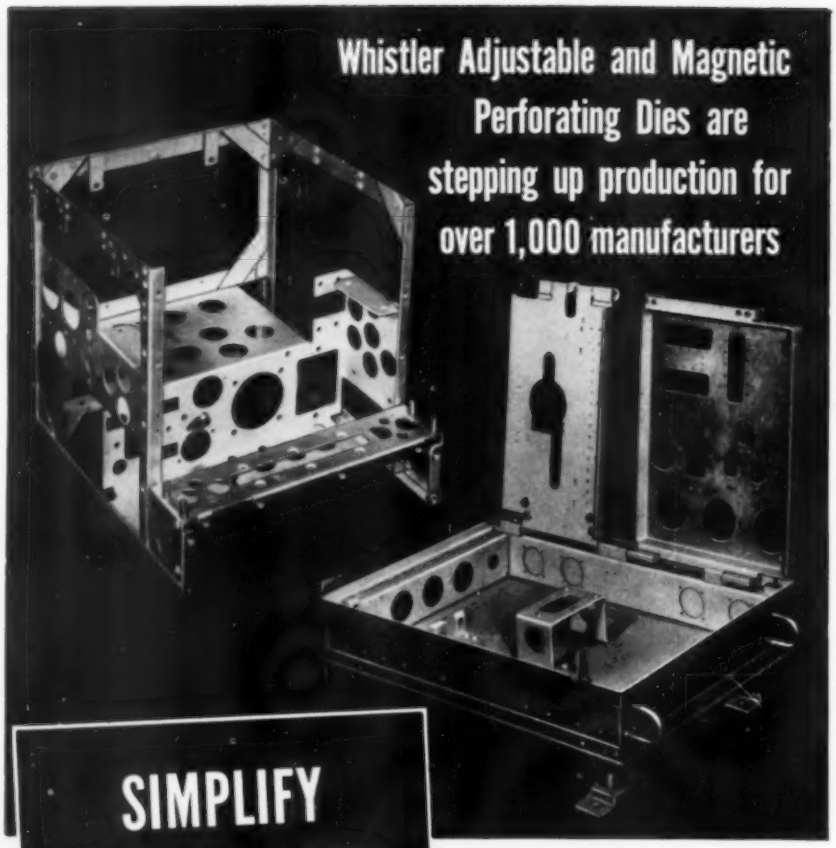
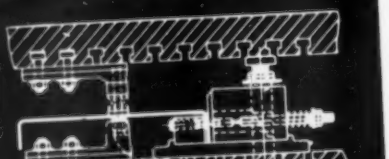
Rotary Surface Grinders, Cylindrical Grinders, Flat Circular Cutter Grinders, Internal Grinders, Carbide Tool Grinders

Agents in industrial centers of United States and Canada

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-211



SIMPLIFY COMPLICATED PIERCING OPERATIONS



Use this HU-50 90° Perforating Unit on the same job with other Whistler Dies ...often saves extra press operations.

USE WHISTLER Adjustable and Magnetic Dies for perforating, notching and slotting sheet metals ... fast, accurate and cost cutting. Complicated patterns can be set up quickly. Hole arrangements can be changed in the press...without waiting and at no extra cost. New HU-50 units, that pierce at 90° angle, can be used in conjunction with standard perforating equipment. Fewer press operations are necessary.

Re-use the same dies in different arrangements on many jobs. Punches and dies are interchangeable.

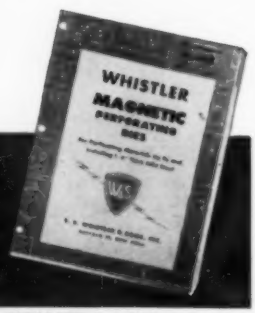
Whistler Adjustable Dies can be used in practically every type press. Standard sizes and shapes of punches and dies available up to 3 inches. Special sizes and shapes to order.

S. B. WHISTLER & SONS, Inc.

744 Military Road

Buffalo 23, New York

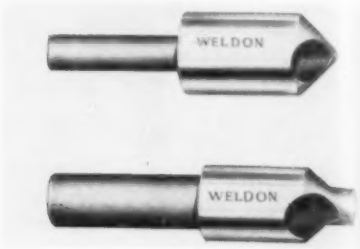
For prices and application data on this modern way to speed production and cut unit costs, write for these illustrated Whistler catalogs.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-212

Chatterless Deburre

Development of an unusual ty e of countersink and deburring too has been announced by The Weldon Tool Co., 3000 Woodhill, Cleveland, Ohio. Principal advantages of the new ools, for 82 degree angle countersinkin and

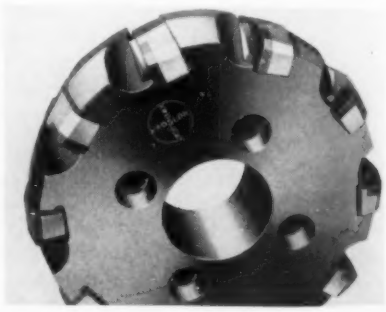


for 90 degree angle deburring operations, are greater ease in cutting and they have but a single cutting edge which prevents chatter.

Both tools, which are regularly made for right hand cut in standard sizes, are also made to order for special requirements. **T-4-2121**

Face Milling Cutter

Three basic members, body, blade and wedge, compose Kroslok, milling cutters introduced by the Cutting Tool Div. of Motch & Merryweather, Penton Bldg., Cleveland 13, Ohio. Cross serrations on one side of the body channel mate with similar cross serrations on the blade assuring rigid holding of the blade in the body. The wedge is driven



between the smooth side of the body channel and blade after the cross-serrated pattern is mated. Two basic types of bodies are offered: general purpose and heavy-duty, both for ferrous and nonferrous applications. Weight distribution design obtains a flywheel effect. Heavy construction prevents body distortion. A generous chip groove keeps chips cleared from the work. Right-hand and left-hand bodies and blades are offered in high-speed steel, and cemented carbide-tipped. Blades are interchangeable within respective body types. Diameters are 3 through 24 inches and also special sizes. **T-4-2122**

Hand File

Saginaw Tool Industries Inc., 728 Lowe St., Saginaw, Mich., has introduced a lightweight, streamlined carbide hand file.

The file can be resharpened to as good as new many times, thus multiplying savings.

Complete information and prices on this carbide hand file can be obtained from the company. **T-4-2131**

Rectifier Welder

A 400-amp, three-phase, d-c, rectifier-type welder with a 60-percent duty cycle similar in construction and operating principle to the 300-amp series announced a short time ago, has been designed by the General Electric Co.'s welding department.

Designated Type WR40A, it has a current welding range of 70 to 500 amps, and can be utilized with a variety of electrode sizes for repair, maintenance, and construction work.

Current adjustments are easily achieved by means of a stepless current control. Maintenance is simplified since the unit's side pieces are easily removed.

Instant arc welding is assured since there is no inductive time lag. Because of the high current produced by the unit's six parallel-path selenium rectifiers, stable arcs and resulting smoother welds are made possible.

Few moving parts means reduced maintenance expenses.

A reversible 14- inch forced-draft fan, rated for continuous service, provides proper ventilation and prevents hot spots. Operating on an updraft prin-

YOU CAN ALWAYS DEPEND ON *Steel City* TO FURNISH THE *Right* BRINELL HARDNESS TESTER FOR *Your* NEEDS

Individual requirements differ. Laboratory needs are far different from production needs. The Brinell Hardness Tester you buy must be exactly suited to your application. Our complete line of Brinell Testers includes the correct type for practically every need. Our reputation in this field since 1914 proves that if we do not have what you require, we can easily convert one of our standard models to fit your specifications. On this page are illustrations of two typical Steel City Brinell Testers. Other types available include portable, bridge type, deep-throated and long stroke designs and models to fit into your conveyor line. Write to us for a descriptive catalogue or address of our nearest sales representative.

Dead weight type, manually operated, bench mounted Brinell Hardness Tester. Weights are linked mechanically to ball penetrator. Dash pot below weights makes load application gradual and smooth. Instantaneously select any load 500 kg. to 3000 kg. Exceptionally accurate; low maintenance. Also available as floor model and motorized.

Direct reading type, hydraulically operated, motor driven Brinell Hardness Testing Machine for production line testing. "Direct reading" feature eliminates time-consuming use of Brinell microscope, sometimes avoids spot-grinding. Interval timer automatically controls testing cycle. Simplified knee switch operation. Tests up to 800 pieces per hour.

At the **TOOL SHOW** *Booth 1316*

MANUFACTURERS OF MACHINES FOR TESTING PHYSICAL PROPERTIES OF METALS

Brinell, Ductility, Universal, Tensile, Compression, Transverse, Hydrostatic, Special Testing Machines, Flex-Tester and Proving Instruments

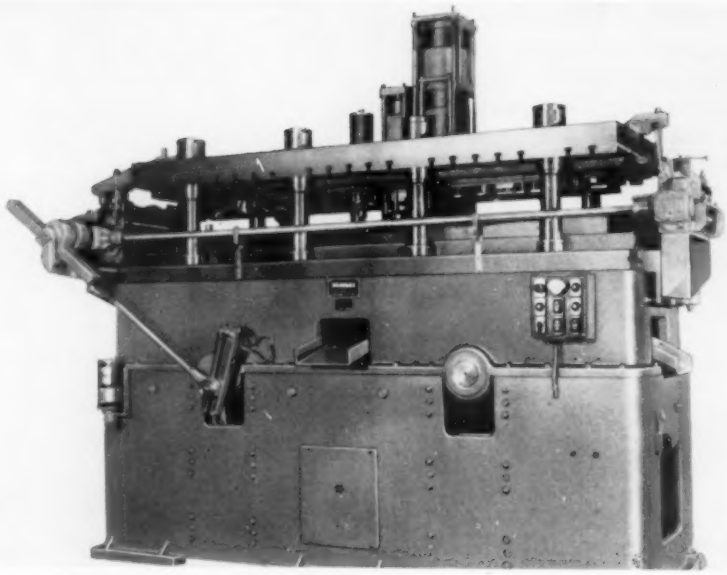
Steel City Testing Machines Inc.

6805 LYNDON AVE. • DETROIT 38, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-213

ciple, the cooling system takes cool air near the floor, preventing the recirculation of exhausted hot air that is continually rising.

The unit is 35 inches wide, 26 inches deep, 47 inches high over-all, and weighs 660 pounds. **T-4-2141**



Progressive Dies

Multiple - crank progressive die presses are now available from Brandes Press Co., 6408 Euclid Ave., Cleveland 3, Ohio.

Primarily, the series of multiple cranks is designed to do one stamping job with progressive dies to eliminate the repeated handling on conventional presses.

Theoretically, there is no limit to the length of one of the multiple-crank presses. Cranks are evenly synchronized and the presses are designed to add any number of the double-crank combinations.

Features built into the press insure an even pressure on all stations of the die. The top platen is always parallel with the bed, which means that there is no tipping under load.

The Brandes double-crank unit is completely engineered in sizes from 100 to 4,000 tons, although each press is built to customer's special use.

The 100-ton double-crank press will take a progressive die up to 100 inches in length or a little over 8 feet, while the giant 4000-ton press takes a 20-foot die. Strokes are available up to 24 inches, which permits an unusually deep draw.

Illustrated is the 300-ton unit designed for progressive dies up to 12½ feet in length. There is ample space for die cushions on the top platen, as well as die cushions inside the press for deep draw work. It is used in the automotive industry to produce hub caps and inner headlight bowls. One press alone produces more than nine conventional presses, and at less cost. **T-4-2142**

Coolant Separator

Magnetic contaminants may be removed from coolant used with practically any type of metalworking machinery by means of a coolant separator introduced by Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee, Wis.

Alnico nonelectric permanent type magnets are utilized to separate magnetics from the coolant. These magnetics adhere to the drum surface of the separator, forming brush-like clusters that sweep out nonmagnetic particles. Clear coolant emerges from either

Severance REGRINDING SERVICE

RECONDITIONING TO *New Tool* PERFORMANCE AT A FRACTION OF *New Tool* COST

HIGH SPEED *We Regrind* MIDGET MILLS • ROTARY FILES BURRS • COUNTERSINKS • COUNTERBORES END MILLS • MILLING CUTTERS • REAMERS **CARBIDE**

AMERICAN MAJOR INDUSTRIES FINDS IT PAYS

American Major Industries are now sending their dull cutters to Severance for regrinding because they know (1) strategic material is being conserved (2) quick deliveries are assured (3) their reconditioned tools will give new-tool performance, and (4) their production costs are lowered. This SEVERANCE SERVICE is paying-out for others — It will Pay you too!

At SEVERANCE, New-Tool Craftsmen, using the same precise skill and care that they do in grinding new tools, regrind your cutters. Send in your dull cutters today!

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of the side outlets located near the front of the machine. Swart is easily removed without need of extra equipment. Design of the separator makes installation into existing line a simple matter.

Cleaner coolant lessens scratching of pieces; still further, wheels don't load up, and tools don't dull as quickly. Several advantages may be claimed for magnetic coolant separators: longer tool and wheel life; fewer rejects; elimination of down time for cleaning coolant; less coolant loss and low operating and maintenance costs.

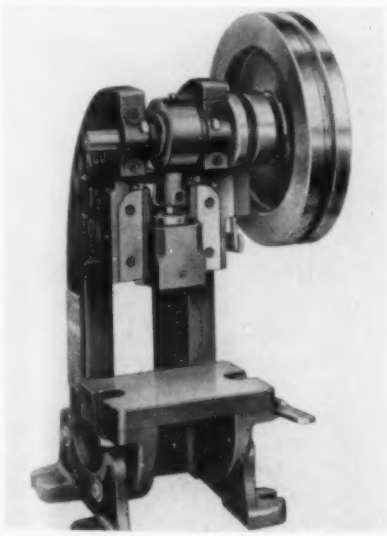
Details and operating diagrams are shown in the Dings bulletin B-1513-A.

T-4-2151

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Midget Press

Announcement of a precision-built, 1½-ton punch press is made by Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, Calif., which follows the general lines and specifications of their earlier 4 and 5-ton presses. This midget, which is made for continuous work, offers ¾ inch as standard stroke, with 1 inch optional at extra charge. The press is open-back and inclinable; all parts are made extra heavy for longer life and trouble-free operation.

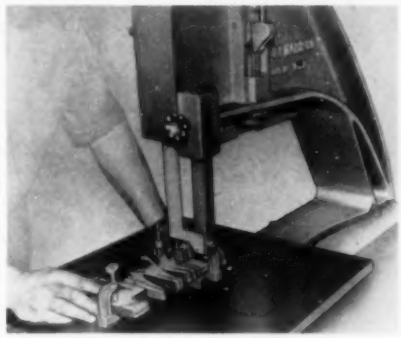


Construction includes a solid crankshaft of heat-treated and precision-ground alloyed steel; roller bearing-mounted flywheel; self-contained clutching mechanism independent of the crankshaft; drive collar made of heat-treated and ground alloyed steel; connecting rod and crankshaft bearings of special alloyed bronze; ram and ram guides 90 degree V-type with oversized length; frame of special alloyed casting structure, preheat-treated, tested and precision-machined for positive accuracy.

T-4-2152

Saw for Stacked Material

Especially designed for cutting stacked sheet metal, this three-wheel band saw with 24-inch throat has versatile speed control which makes it readily adaptable for cutting almost



Quick Change Tools

FOR
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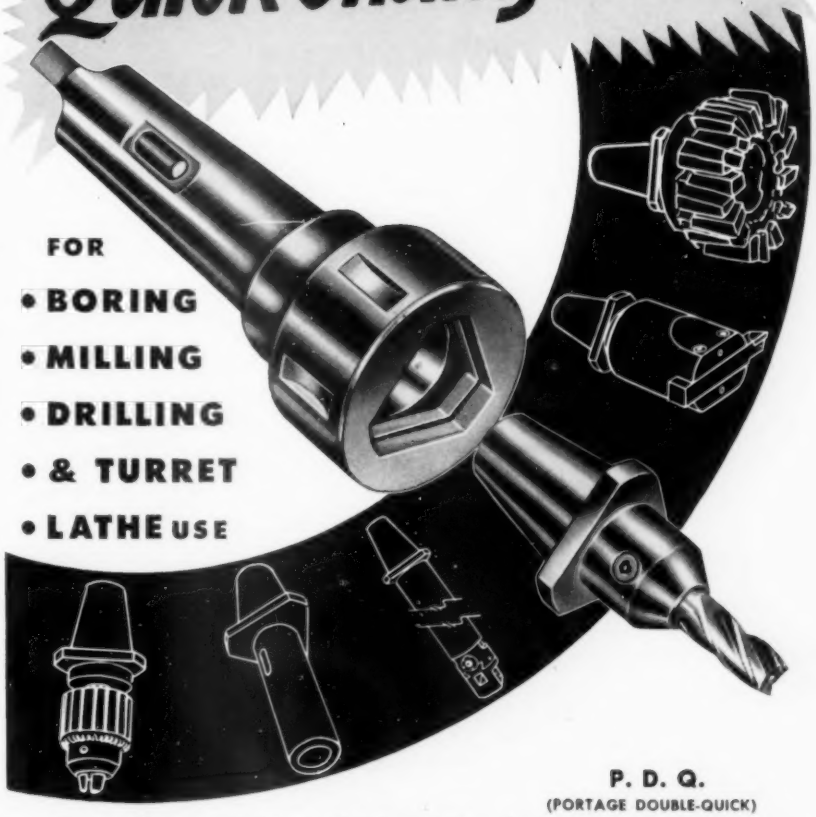
• MILLING
• DRILLING
• & TURRET
• LATHE USE



P. D. Q.
(PORTAGE DOUBLE-QUICK)

Changes from one tool to another is a matter of seconds. Three point locking feature and tapered shank assures repositioning and eliminates "run out." Send for catalog describing individual holders and adapters or for specific information on your machine tools.

PORTAGE Double-Quick TOOL CO.
1054 Sweitzer Avenue • Akron 11, Ohio

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Which part cut costs 78% and makes customers far happier?

The two-part fastener at left was used to hold the louvres in a line of fluorescent lighting fixtures. The cost of this fastener was high – $35.00 per thousand – and the customer was left with the time-consuming job of mounting the louvres when the fixture was installed.

The single COLD FORMED part at right now replaces the two-part machined fastener – costs only $7.50 per thousand – and enables the manufacturer to ship the fixture completely assembled, with every louvre already in place!

The dollar savings have already mounted into the thousands. The gain in customer good-will is priceless!

How many thousands of dollars can COLD-FORMING save you?

Savings like this aren't at all unusual. Milford's COLD FORMING methods are making equally substantial savings for manufacturers throughout American industry . . .

Because Cold Formed Parts Cut Costs:

1) They're formed from wire stock without waste or scrap!

2) They're produced on high speed automatic equipment!

3) They're frequently designed for high speed automatic or semi-automatic application!

Thanks to long experience in COLD FORMING, Milford engineers, designers and product research experts are ready and able to help you cut small-parts costs substantially. They bring to your service Milford's leadership and know-how in the manufacture of semi-tubular, tubular and special rivets, as well as automatic rivet-setting machines.

So put us to work for you. Do it *before*, not after, your design is frozen. Chances are we can help you effect some major savings—both in *time* and *money!*

Write or phone nearest Milford Plant or Sales Representative!

THE MILFORD RIVET & MACHINE CO.

MILFORD CONN. NORWALK CALIF. ELYRIA OHIO AURORA ILLINOIS HATBORO PENNA.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-216

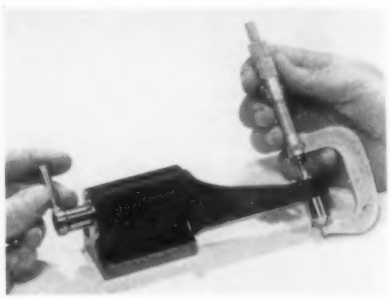
any kind of metal, wood or plastic.

The saw, made by Bett-Mart Mfg. Co., Hopkins, Minn., while only 61 inches high, will allow center cutting on sheets up to 48 inches. Since the blade stays in position on the wheel, complete blade control for smooth, accurate cutting is assured. Blade speeds can be quickly adjusted from 100 fpm (for iron, steel, and forgings) to 600 fpm (for stacked aluminum and galvanized sheets, and bronze, brass or copper) to 3,300 fpm (for wood, plastics, and stainless steel). Smooth, friction cutting of stainless steel up to 3 gage is possible at 3,300 fpm. **T-4-216**1

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Radius Dressers

The General Scientific Corp., 603 N. La Brea Ave., Los Angeles, Calif., has developed a precision radius dresser called the Little General. Primarily, it is designed to give the machinist perfect "feel of the wheel" when dressing



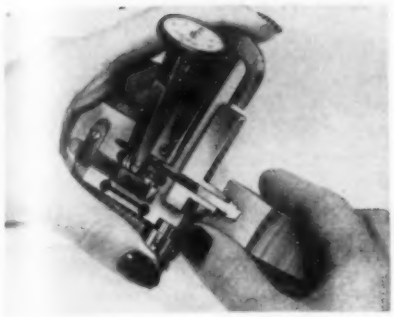
a radius. The sturdily constructed tool features maximum smoothness and complete rigidity.

Angles tangent to radii can be quickly and easily dressed. Radius dimensions are rapidly and accurately set in a range of 0.001 and 0.002 (needle diamond permitting) up to 9/16 inch. Diamond concentricity is always completely adjustable, permitting a perfect radius to be dressed. Illustration shows simple operation of Little General radius dresser. **T-4-216**2

Adjustable Snap Gage

Widths of Christmas tree serrations in a jet engine compressor rotor disk are being measured with the portable, adjustable snap gage manufactured by Federal Products Corp., 1144 Eddy St., Providence, R. I.

Small, compact and fully insulated from heat transfer by a wrap-around pregwood handle, this one gage meas-



ures all three rows of blade serrations regardless of their angles. Uniform gaging pressure is independent of operator.

Designed with an extra long gaging depth, the rigid tool steel jaws are adjustable for extra wide measuring range. Reference contact (a spherical tungsten carbide ball), and the sensitive contact (two pieces of tungsten carbide rod) are accurately fastened to the jaws enabling immediate self-centralization. No rocking is required.

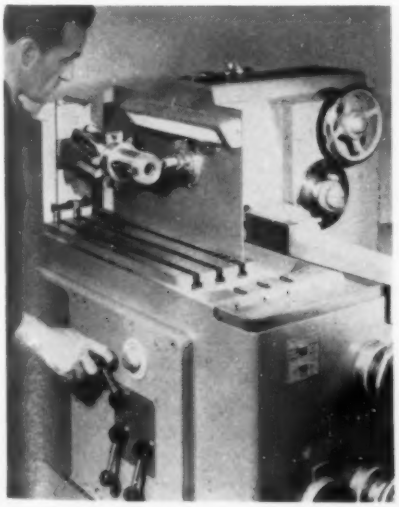
A pantograph motion-transfer unit machined in the tool steel frame transfers the slightest variation from the master setting to this Federal Model 6 Testmaster, graduated in 0.0001 inch.

To operate the gage, the inspector pushes retract button to close contacts and inserts the gage from workpiece side. When button is released contacts automatically seat themsalves to serrations and Federal Testmaster shows amount of variation from master setting. **T-4-2171**

Versatile Mill

Keyways, splines and slots can be accurately milled at exceptional speeds by means of the operating principle incorporated in the Hurth LF 32 semi-automatic machine, distributed by Kurt Orban Co., Inc., New York 17, N. Y.

Typical milling times are the only 0.54 min. required to mill a keyway $\frac{1}{4}$-inch wide by $\frac{3}{4}$-inch long by $\frac{1}{8}$-inch deep; or the 90 min. needed for one $\frac{3}{8}$ inch by $\frac{5}{8}$ inch by $\frac{3}{16}$ inch or the only 2.21 min for one $1\frac{1}{4}$ inch by $2\frac{3}{8}$ inch by $\frac{7}{16}$ inch.



The method, which offers both speed and accuracy, is attained by an alternate lowering and raising of the spindle against set stops, which can be adjusted to very fine tolerances. Vertical displacement of the oscillating movement of the spindle can be adjusted from 0.08 inch to 0. Lowering and raising of spindle are hydraulically controlled, and transmission is play-free.

Except for chucking and removal of workpieces, operation of the machine is automatic.

As a further economy feature, this cutting method equalizes wear on the cutting tool. A correctly sharpened cutter will mill up to 300 slots without requiring sharpening or impairing accuracy.

The milling carriage has a maximum horizontal movement of 15 inches. Maximum manual vertical adjustment is 4 inches; automatic vertical adjustment is from 0 to 0.075 inch per minute. Worktable size is $47\frac{1}{4}$ by 15 inches. Maximum diameter of milling cutter is $1\frac{1}{2}$ inch.

Fifteen spindle speeds are provided, from 90 to 2240 rpm. Deep feed rates of spindle are 0.00059, 0.00118 and 0.00236 ipr. Longitudinal feed of milling carriage has 12 rates, either from 0.49 to 6.3 ipm, or from 0.98 to 12.6 ipm. Return feed rates can be set for either the same as longitudinal rates or for 5 times these values. Five speeds are provided for rapid carriage traverse; rapid return traverse is $157\frac{1}{2}$ ipm. Axial movement of the spindle is $4\frac{3}{4}$ inches. **T-4-2172**

END MILL SPECIALISTS
and What it...
...Means to YOU...
HIGH SPEED
TWO FLUTE
THREE FLUTE
FOUR FLUTE
LONG LIFE
MELIN
The major portion of production at Melin Tool Company is devoted to End Mills. When you specify MELIN...you know your order is receiving personal attention. There are no priorities in other divisions.
Write for the new Melin Tool Catalog and Price Sheet.
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3372 West 140th St., Cleveland 11, Ohio

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STOP WASTING TIME, LABOR, MATERIAL and VALUABLE SPACE

MORE VERSATILE THAN NIBBLING | SAVE EXPENSIVE PRESS DIES ON SMALL RUNS | MORE VERSATILE THAN ROTARY SHEARS | FASTER THAN BAND SAWING | FASTER AND CLEANER THAN FLAME CUTTING

LOOK at what one PULLMAX CAN DO FOR YOU

1. Straight cutting
2. Design cutting
3. Inside square cutting
4. Circle cutting* (inside and outside)
5. Beading
6. Folding or Joggling
7. Slot cutting
8. Louver cutting to any length and number

You'll find, just as hundreds of other industries have discovered, that the Pullmax machine can replace thousands of dollars worth of expensive equipment and do all of the work faster and better than the more expensive equipment. *"Just imagine cutting a 48" circle of 3/16" stainless steel in 52 seconds!* And, what's more, Pullmax leaves an edge that requires little, if any, finishing. Small runs of formed metal shapes can be produced on a Pullmax machine without the use of dies or fixtures. In many installations Pullmax has paid for itself entirely in a matter of a few weeks. Why not let Pullmax reduce your labor costs from dollars to pennies.

Pullmax sales engineers will be glad to call on you and discuss your problems. Our engineering department will be glad to study your blueprints and show you how your production problem can be solved.

Pullmax machines are backed by nationwide service, and stocks of machines and parts.

WRITE FOR THIS CATALOG OF MONEY-SAVING METAL WORKING IDEAS

AMERICAN PULLMAX COMPANY, INC.

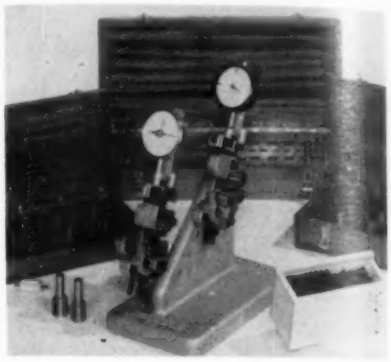
2451 NORTH SHEFFIELD AVENUE • CHICAGO 14, ILLINOIS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-218

Thread Gaging

Complete analysis of screw threads for assemble-ability, and pitch diameter accuracy, is possible with the roll-thread comparators introduced by The Johnson Gage Co., 534 Cottage Grove Rd., Bloomfield, Conn.

These versatile tools, identified as



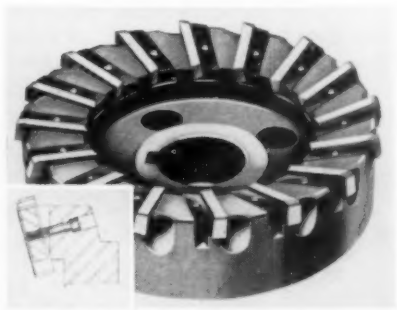
Models CG and CN, are capable of gaging approximately three hundred standard and special threads in the size range ¼ through ¾ inch.

Total weight, less masters, in a 10 x 10 x 15 carrying case is approximately 25 pounds. **T-4-2181**

Face Milling Cutter

Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich., announces a solid carbide inserted blade face milling cutter for milling cast iron, malleable iron, brass, and other metals.

Since this cutter has a far greater number of solid carbide blades than previously supplied, use of higher speeds as well as faster feeds are possible in order to attain higher production and better finish.



The construction of this cutter is very similar to the IBH face mill. Solid carbide blades are extra heavy and are arranged radially for maximum blade life. They can be reversed and used in either right or left-hand bodies.

This cutter is available in five standard sizes: 6, 8, 10, 12 and 14-inch in both right-hand and left-hand, as well as in specials. **T-4-2182**

Turret Indexing Unit

Dwell times ranging from 0.835 seconds to infinity are possible with the clutch-operated series of turret indexing units now offered by Swanson Tool and Machine Products, Inc., Erie, Pa.

The clutch-operated models are available with 8, 16, 24 or 32 work stations and 20, 30 or 40-inch turret diameters. Maximum indexes per hour range up to 2154.

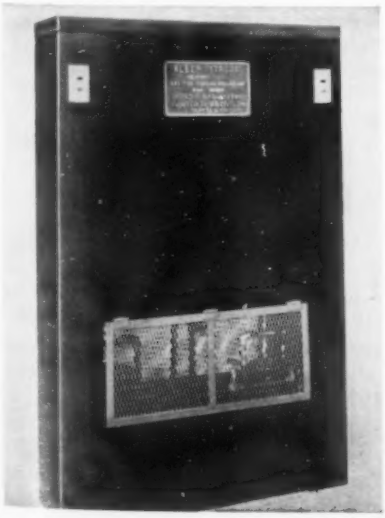
Solenoid operated, the clutch drive is especially suited to applications which require a variable or infinite work cycle, or where it is desirable to have the operater determine the indexing cycle by means of push-button controls. Where drilling cycles and other similar operational procedures require automatic control, limit switches may be used to prevent indexing before any given operation is completed.

Harmonious indexing and accurate positioning at all work stations are assured by the cross-over cam and locking device developed by Swanson for earlier units.

Complete specifications are given in bulletin TC-29. **T-4-2191**

Oil Recovery Unit

Kleer-Stream, an electrically controlled and operated automatic oil recovery unit, has been announced by Pioneer Pump Div. of Detroit Harvester Co., 2750 Guardian Bldg., Detroit 26, Mich. Designed to recover re-usable oil, they also assist in reducing stream and lake pollution.

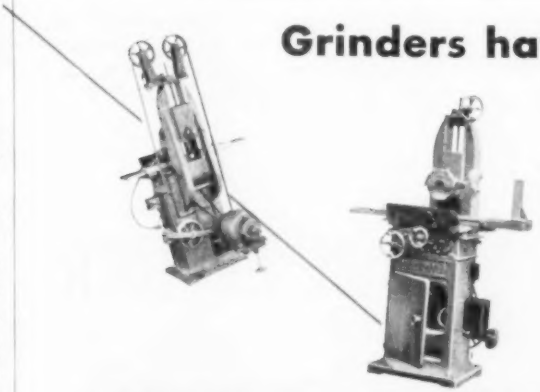


The unit is for use with parts washers, coolant pumps and reservoirs handling liquids which contain oil. It saves washing solutions, oil and applied compounds.

Resultant savings are twofold: the saved oil and compounds, normally lost as sewage, may be re-used and expenditure for coolants and compounds is reduced.

Kleer-Stream units provide speedy separation of the oil from the washing solution from parts washers and automatically returns the re-usable solution to the washers. At the same time it stores the recovered oil in a reservoir in the top of the unity from which it may be periodically withdrawn into drums.

Function is wholly automatic with float and solenoid valve control. When used in conjunction with parts-washing machines or reservoirs and supply lines containing immiscible liquids which may be discharged into the unit by gravity flow, no auxiliary pump is re-



Grinders have changed . . .

IT'S TIME YOU CHANGED GRINDERS

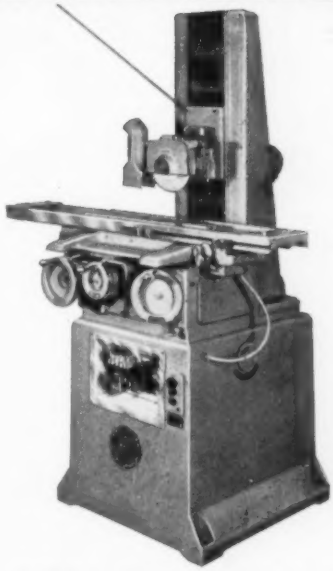
REID GRINDERS

built in '54 offer more improvements . . .

. . . improvements you can't afford to overlook, if your toolroom is to meet today's precision tooling demands — competently, quickly and profitably.

Finger-tip level controls for easier operation; one-piece column casting mounted *on* the base for maximum rigidity; hand-scraped ways for accuracy; telescoping dust plates for protection of vertical and cross feed mechanisms — these are but a few of the many improvements designed by our engineers to make Reid Grinders a standard of precision and dependability .

If your toolroom still harbors a surface grinder like those above, for the sake of efficiency,



PLAN NOW FOR REPLACEMENT!

Condensed specifications — Model 618V
Capacity: 6" x 18" x 17¼" (spindle center to table)
Work table: 51" x 8"
Power-feed table: variable, 12 to 35 ft./min.
Standard wheel: 7" x ½" x 1¼"
Weight: 2100 lbs. Floor space: 71" x 43½"

see our catalog in MACHINE TOOL CATALOGS or write for copy

Please request Catalog 618-15

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-219

quired, and pipe or hose connections are used.

The liquid supply is taken into the center compartment where it is discharged into a V shaped baffle or trough, which is universally adjustable around an axis on which the trough is suspended.

Primarily designed for recovering oil, the units may also be used for the separation of other types of liquids which have a different specific gravity and characteristics which cause them to remain in suspension when mixed.

T-4-2201

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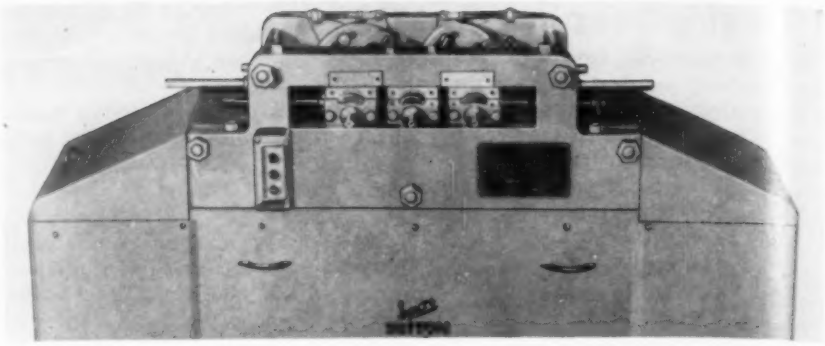


Straightening Machine

Straightening of tubes and bars of small diameter is the job for this table-high machine introduced by Sutton Engineering Co., Bellefonte, Pa.

Known as the Syncro-Drive, the straightener has a horizontal pass line between two driven rolls opposed by three smaller pressure adjusting rolls. All five rolls are motor driven and the machine operates without guides.

Center distances between all rolls are adjustable and all five rolls are angularly adjustable, a flexibility permitting accurate straightening over a wide range of sizes and grades of material.

The first of the units in use is a No. 00 Syncro-Drive straightener with a capacity of ⅛ to ⅝-inch OD tubes. In use, it is operating with stainless steel tubes of various tempers at straightening speeds from 60 to 300 fpm using a 2-hp variable speed drive.

Several sizes of the Syncro-Drive straightener are being built for tubes and bars down to 1/16-inch OD in stainless steel, aluminum, brass, Inconel, and other ferrous and nonferrous metals.

Patents are pending on the design which incorporates automatic coordination between the drive for the two larger rolls and the drive for the three smaller pressure adjusting rolls. This feature makes it possible to maintain relatively constant surface speeds between opposed rolls for long roll life. The design also provides automatic centering of the tube in the pass line without guides.

Extremely compact, measuring 5 ft long by 3 ft 6 in. wide by 3 ft high, the straightener takes a minimum of floor space. Setup time is particularly fast, with all adjustments easy to make.

T-4-2202

NEW Hammond 6" CARBIDE GRINDER

6 Exclusive Features

BRAKE on each end for handy, quick stopping when reversing.

NO SPRAY-NO SPLASH SWIVEL GUARD closes one side of wheel while other is in use. It is the heart of Hammond's patented No Spray - No Splash feature.

NO SPRAY - NO SPLASH SPOUT aerates and breaks up coolant which flows without force.

NO SPRAY - NO SPLASH PAN catches any excess spray or splash and keeps operator and floor dry.

SAFETY CUP DISC fills the cup of a silicon carbide wheel, preventing tool or hand from entering. An important safety feature — patented.

TABLE SCREW FEED makes table adjustment easy and protects against wheel damage.

TABLE easily tilts to any degree from 30° above to 30° below horizontal and quickly locks with a single lever. Table is surface ground and has a cored self-cleaning slot.

TWO MODELS AVAILABLE — *WD-6* Wet or Dry as shown, and *D-6* Dry (bench or floor). Is of the same general construction as the Model WD-6 except for the wet equipment.

There are more new and exclusive features on the Hammond Model WD-6 than on any other low-cost wet 6" carbide grinder. It is a full-fledged machine which incorporates the many features of the larger Hammond 10" and 14" Grinders. *Compare* and you'll find no equal in the low-cost 6" field.

Write for catalog showing America's most complete line of carbide tool grinders and finishers.

"FINEST IN THE LOW PRICE FIELD"

Hammond Machinery Builders INC.

1661 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

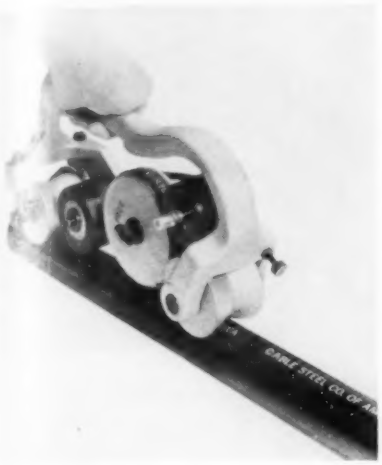
See this machine in operation at Booth 1303—ASTE Show

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-220

Bar and Tube Printer

Continuous printing of tradenames, codes, inspection marks, etc., on flat, round, square or hexagonal surfaces may be accomplished with the No. 230 Matthews portable printer, developed and manufactured by Jas. H. Matthews & Co., 3923 Forbes St., Pittsburgh, Pa.

Riding on front and rear positioning rolls, the printer automatically adjusts to size and shape of the material to be marked. As the printer is manually



rolled along the stock on the positioning rolls, the rubber-covered drive roll, mounted directly behind the front positioning roll, is actuated by contact with the stock; thereby transferring power to the rotating printing roll, which gains the proper amount of ink from the self-contained ink fountain, and then rolls on the impressions. Since the copy moves at the same rate of speed as the printer, clear, unsmudged impressions are obtained.

The felt ink fountain is fed by capillary action, which maintains the ink pad at proper saturation for perfect printing. Consistency of the ink and design of the fountain prevent overinking or leakage.

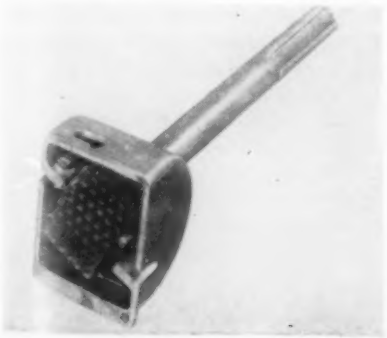
For printing versatility solid rubber dies or interchangeable rubber type and multiple character logotype with letters, figures and code symbols are available for use in the portable printer in a size range from $\frac{1}{8}$ to $\frac{1}{4}$ inch.

The complete aluminum unit weighs approximately 8 lb. **T-4-2211**

Wheel Dressers

Most recent addition to the line of Newman grinding wheel dressers is this heavy-duty dresser and nine various grades of dressing wheels, including steel cutters for the heavy-duty dresser.

The model No. 5 heavy duty dresser, especially suitable for foundry and heavy grinding, is equipped with specially developed, sealed ball bearings and high-tensile steel cutters.



Of simple and sturdy design, it is so light in weight that women workers can easily use it properly.

Cutters are interchangeable with abrasive wheels to fit.

Wheels are easy to change by simply loosening two lock nuts on either side of the housing, removing the retainer screws and lifting out the entire assembly. Then remove the wheel nut and replace new wheels. **T-4-2212**

Power Unit for Oil Hydraulic Equipment

Self-contained power units for the operation of oil hydraulic equipment, either individually or in groups, are being introduced by the Harvill Mfg. Co., Corona, Calif.

Developed as a part of their die casting machines, the Harvill oil hydraulic power units are available in a range of capacities from 7 to 54 gpm oil consumption or delivery of pressures of 200 to 1000 psi; hp ranges from $7\frac{1}{2}$ to

SENTRY

"ALWAYS ON DUTY"

ELECTRIC FURNACES FOR H.S.S.* hardening

Sentry Furnaces at Rico Heat Treat 300 Header Tools Daily

In the production line of the Rico Machine Co., E. Providence, R.I., a key spot is reserved for heat treating. Four Sentry electric furnaces, employing the famous Sentry Diamond Block atmosphere, produce header tools to exacting hardness specifications entirely free from oxidation or decarburization.

Special STRUCK SLOT hammer, a special item that gets the special heat treatment it deserves.

Request Catalog R-45

*High Speed Steel

For optimum hardness with complete protection against scale or decarburization, heat treat H. S. steels with Sentry Model "Y" Furnaces and Sentry Diamond Blocks.

Illustrates and describes all sizes of Models Y and YP Furnaces and The Sentry Diamond Block Method

THE SENTRY COMPANY

FOXBORO, MASSACHUSETTS

Visit us at Booth 533, ASTE Show, Philadelphia, Pa., week of April 26th

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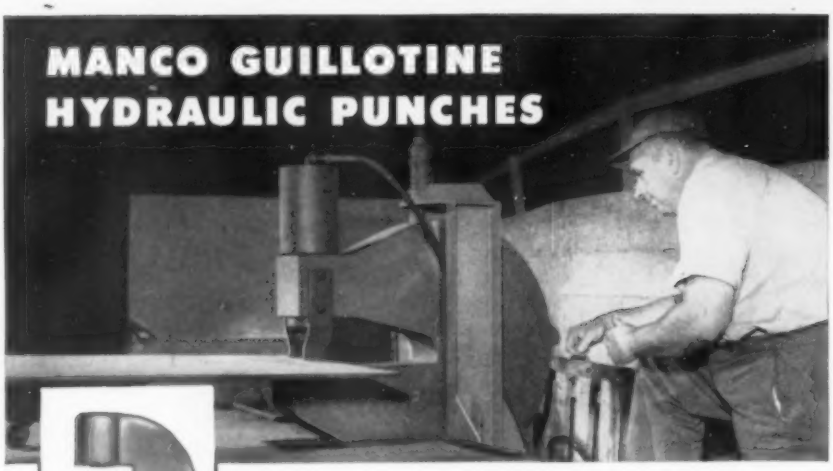
MANCO GUILLOTINE HYDRAULIC PUNCHES



Model P-20-186
Capacity 1" hole in 3/8" mild steel. Reach 15/8". Weight 44 lbs. Available with high-speed electric hydraulic or portable manual pump.

HIGH CAPACITY . . . STRUCTURAL OR FIELD WORK

There is a wide variety of fast, powerful Manco Guillotine Hydraulic punches with varying capacities, available for stationary production use, semi-portable boom-mounting, or complete portability for use in the field. Model P-75-E, above, equipped with Manco high-speed electric hydraulic pump offers 75 tons thrust and capacity for 1" hole in 3/4" steel. Other models up to maximum capacity for punching 3 3/4" hole in 16-gauge sheet.

Write, stating requirements: hole size, location, quantity, accessibility, material punched

Dept. T-4 **MANCO MFG. CO.**
Bradley, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-222-1

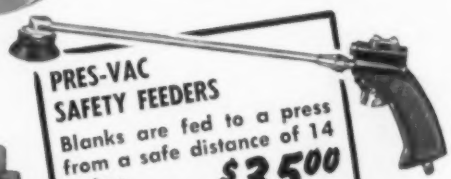
Save Money! Save Fingers!

Cost of Amputated Fingers

It pays to keep fingers out of presses!

AIR BLAST VALVES
Eject parts at each stroke of Press. PRICE **$29.00**

Prices F.O.B. Plant



PRES-VAC SAFETY FEEDERS
Blanks are fed to a press from a safe distance of 14 inches. PRICE **$35.00**

F. J. LITTELL MACHINE CO.
Speed with Safety

Write for FREE Catalog
AIR DIVISION
4199 RAVENSWOOD AVENUE
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District Offices: DETROIT and CLEVELAND

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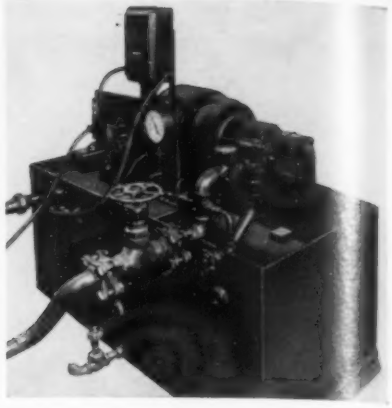


30 for these oil deliveries.

The Harvill power unit pumps are completely unloaded when the pressure setting is reached and do not pump against a pressure head or relief valve.

Rapid operation of equipment is facilitated by the 2-inch pipe delivery and return. The unit is complete with reservoir, accumulator (nitrogen charging inlet valves and bottle connections), baffled type oil cleaner, automatic water cooling, all electrical switching gear with wired-at-factory overload protections and 2-inch high pressure shutoff valve. **T-4-2221**

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Parts Cleaning Machines

Recently introduced models of Turbo-Blast parts cleaning machines, which utilize physical force, chemical detergency and heat, have been announced by Storm-Vulcan, Inc., 2225 Burbank, Dallas, Texas.

Models range in sizes from 20 to 2300-gallon solution capacity for applications in cleaning, degreasing and stripping. All models are equipped with impellers which create a violent, fast-cleaning scrubbing action for everything from engine blocks to nuts, bolts and small parts regardless of recessed areas, removing all types of greases, oils and drawing compounds.

Some models are equipped with baffle plate covers which permit powerful agitation with two-layer stratified cleaning materials heretofore used only in soak tanks or with mild agitation. Units are heated by steam, fuel oil, natural gas or manufactured gas, thermostatically controlled. Though existing models are said to meet most industrial and maintenance requirements, special Turbo-Blast cleaning systems can be devised, such as conveyorized systems, with varying patterns and fluid application. **T-4-2222**

Universal Toolholder

Possible savings in time is the principal feature of an unusual type toolholder which may be used as a single holder for multiple uses.

In use, the toolbit is held firmly in a split swivel ball which is clamped by one bolt, in any desired working position. Further, this versatile, multi-angle position holder enables the machinist to swing the tool bit to any required angle.

Known as the Crystal universal toolholder, it takes 3/8-inch square or round toolbits, and 1/2-inch cutting off tools.

The toolholder is drop forged from a special steel, accurately machined, heat treated and hardened.

Sole licensee in this hemisphere is Seaboard Steel Co. of America, Inc., 1775 Broadway, N. Y. 19, N. Y.

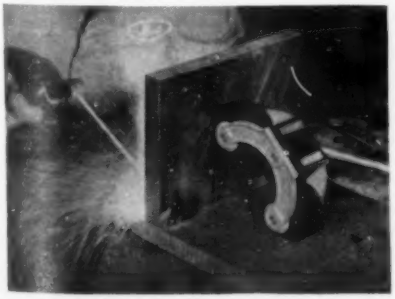
T-4-2231

Magnetic Positioner

A universal holding fixture for production and welding operations has been announced by the Standard Portable Cord Co., Inc., Jamestown, N. Y.

Called the "Magic Positioner," this holding device consists of three 45-pound pull, neoprene covered, Alnico V. guaranteed permanent magnets. The magnets are held in a die-cast, high tensile aluminum frame and have full 360-degree adjustment, regulated by a scale showing 5-degree graduations.

When positioned, each magnet can be locked in place. This feature provides for positioning the tool to conform to any welding operation, and the holding of almost every shape or design, including rings of metal. **T-4-2232**



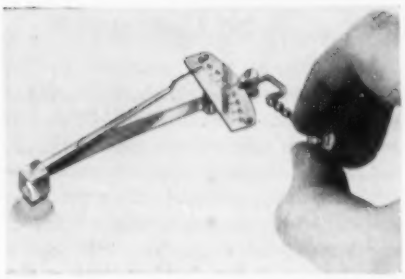
Inch-Gram Torque Wrench

Probably the lowest capacity instrument of its type is offered by the P. A. Sturtevant Co., Addison, Ill., with the introduction of the Standard Model torque wrench F80-I-G for the 0 to 80 inch-gram range. The wrenches are particularly designed for use in the electronics, instrument and precision equipment field for applications requiring special torque testing fixtures.

Practicality of this tiny torque wrench is possible because the operator can concentrate the load position by means of a patented pivoted handle.

Because of the simplicity of design, it may be handled as any ordinary small tool. It is guaranteed to remain permanently accurate.

Widely spaced increment markings on the scale are in steps of 5 inch-grams, and are easily read by an operator from any working position. Other models are available in the same style in ranges from 0 to 8 inch-ounces and 0 to 16 inch-ounces. **T-4-2233**



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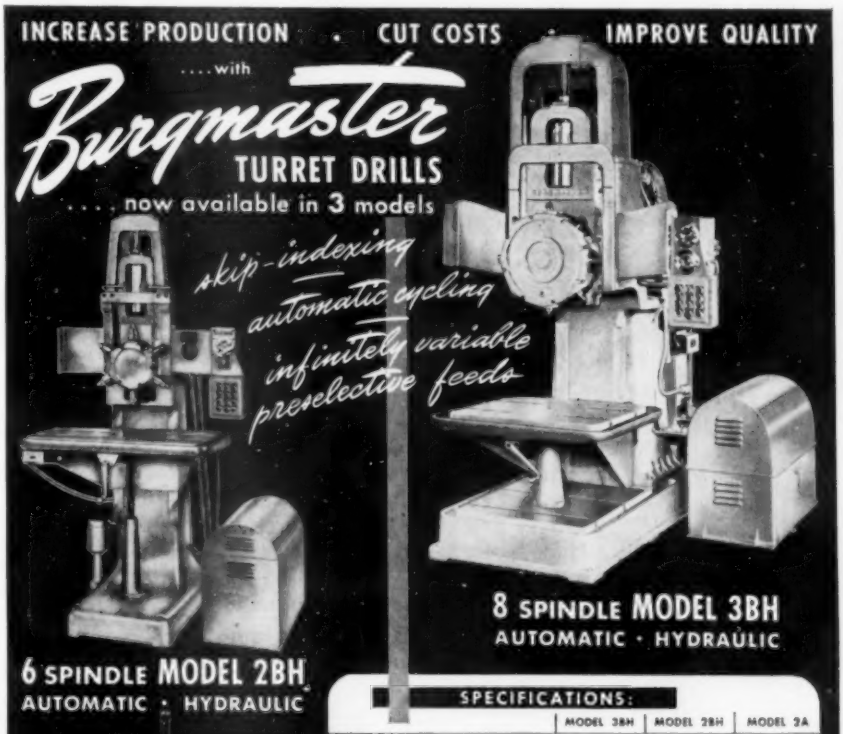
INCREASE PRODUCTION · CUT COSTS · IMPROVE QUALITY

....with

Burgmaster TURRET DRILLS

.... now available in 3 models

skip-indexing
automatic cycling
infinitely variable preselective feeds

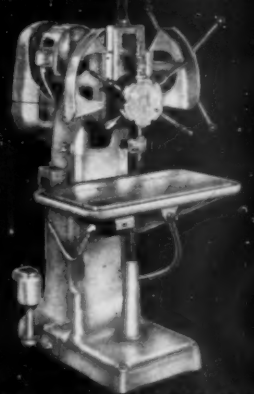


8 SPINDLE MODEL 3BH
AUTOMATIC · HYDRAULIC

6 SPINDLE MODEL 2BH
AUTOMATIC · HYDRAULIC

SPECIFICATIONS:

	MODEL 3BH	MODEL 2BH	MODEL 2A
Drill capacity, mild steel	1 1/4"	3/4"	3/4"
Ram travel	12"	8"	8"
Spindle speeds, preselective	12	12	12
Speed range	115-1700	225-3000	225-3000
Depth control	Preselective	Preselective	Preselective
Throat depth	19 1/2"	12"	12"
Table work surface	25"x 35"	17"x 34"	17"x 34"
Table travel	19"	19"	19"
Max. cl'rance, spindle to table	32"	23"	23"
Max. diameter tool clearance	9"	4 1/2"	4 1/2"
Motor, 2-speed, 1800/900	10/5 H.P.	2/1 H.P.	2/1 H.P.
Weight, approximate	7000 lbs.	2500 lbs.	1800 lbs.
Height	120"	78"	72"
Floor space, approximate	6'6"x 5'4"	60"x 51"	38"x 51"



6 SPINDLE MODEL 2A
MANUAL

WRITE TODAY FOR DETAILED INFORMATION

BURG TOOL MFG. CO. Dept IE-4

2720 DURANGO AVE. · LOS ANGELES 33, CALIFORNIA

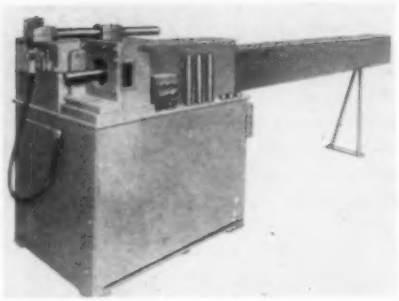
See our display at the A.S.T.E. Show—Booth No. 1635

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-223

Tube Cutter

Development of a machine by the Brehm Div. of The Steel Products Engineering Co. of Springfield, Ohio, has produced a tube cutter that works on the same shearing principle as the Brehm trimming die. Cutting the tube without waste or loss of stock, it leaves a flat unburred edge. The tube cutter is to be shown for the first time at the ASTE Philadelphia Exposition.

With this unit, tubes can be cut into pieces of any length from 3/8 inch on up, and in a wide range of stock thickness in a variety of materials including mild steel, stainless steel, brass, copper, and aluminum. It will handle tubes of any diameter from 3/8 to 2 inches, and has special adapters for larger tubes.



The machine is loaded from the front by sliding the tube onto the cutting arbor.

The operation is entirely automatic: a carriage moves the tube forward until it meets the stop; cutting action takes place; the sheared piece falls into a container; the tube is moved forward again ready for the next cutting action. The entire cycle takes about one second depending upon the length of the piece and the diameter and thickness of the tube. **T-4-2241**

Free Machining Steel

Latrobe Steel Co., Latrobe, Pa., announces the production of a free-machining high carbon-high chromium die steel of the D-2 cold work die steel type.

Identified as Olympic FM, the steel has been reported, after field tests, to have permitted reduction in machining costs up to 50 percent, since it may be machined at speeds and feeds greatly in excess of those normally possible with standard D-2 steels. Further, the material will produce excellent machined surfaces with a resultant reduction in finish grinding time.

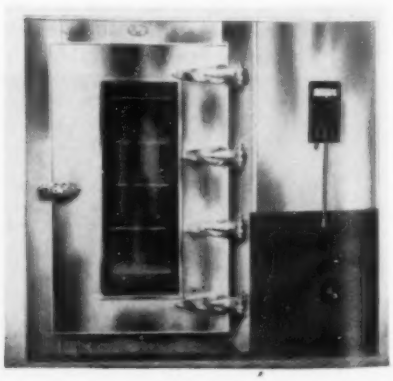
Laboratory tests on Olympic FM specimens have shown that there is no appreciable change in the physical properties or heat treatment normally associated with cold work die steels of the D-2 high carbon-high chromium type. **T-4-2242**

Test Chamber

Webber Test Chamber Model A-30-40FH is designed for large capacity testing at high and low temperatures. Unit illustrated has 30-cubic feet capacity. Special features of the unit include visible type controller, patented heat exchangers and multi-panel visual port and apertures for connections to inner chamber. Construction is of stainless steel throughout with superfine fiber glass insulation.

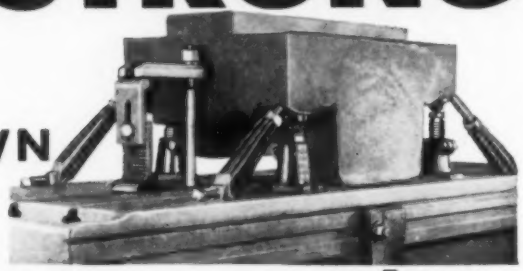
Temperature range is to —40 F on refrigeration cycle and to +200 F on heat cycle. Still other Webber units are available to temperatures of —200 F.

For further information, write to C. M. Shelburn, vice president, Webber Mfg. Co., Inc., Dept. 298, 2740 Madison Ave., Indianapolis 3, Ind. **T-4-2243**

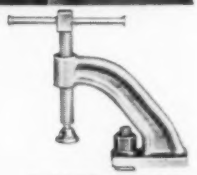


ARMSTRONG

SET-UP *and* HOLD-DOWN TOOLS



PLANER JACKS



T-SLOT CLAMP

NON-SKID JACKS

STEP BLOCK

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

Write for Circular

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5257 W. Armstrong Ave., Chicago 30, U. S. A.

UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS

STRAP CLAMPS

See us at Booth 232, ASTE Show, Philadelphia

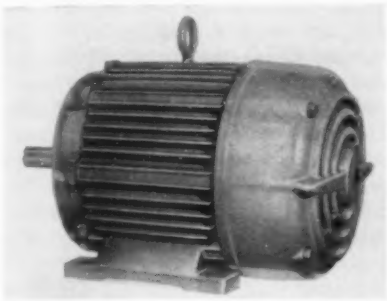
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-224

Electric Motors

Electric motors, redesigned to meet new NEMA rating standards, have recently been announced by the Louis Allis Co. of Milwaukee, Wis. This line will be available in all standard enclosures—open, drip-proof; totally enclosed (pictured here); fan-cooled; and explosion-proof; and will be built up to frame size 326 (40 horsepower at 3600 rpm).

As a result of the redesign, the motors, known as the L.A. line, provide more power in a smaller, more functional package. Other features include improved ventilation and greater protection, more versatile mountings, and lighter weight without loss in mechanical strength.

Bearing construction has been improved over previous designs. Bearings are factory-lubricated with ample

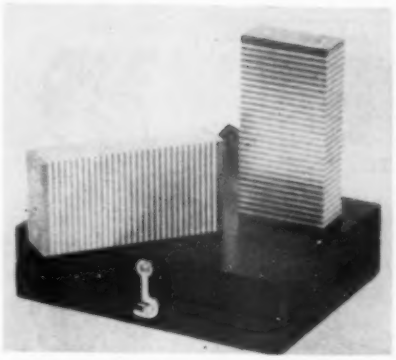


grease supply to give years of service in normal usage without maintenance or attention. Special effort has also been made to use bearings that are easily obtainable from local stocks. Bearing grease-seals have been designed for greater effectiveness to prevent grease from leaking along the motor shaft.

Yet another feature is the more efficient and effective ventilation, obtained through better utilization of aerodynamic principles. **T-4-2251**

Parallels

Aluminum strip spacers between the steel lines are now incorporated into the design of these permanent magnet parallels now being offered by Tagden Enterprises, Dept. 229, Chatsworth, Calif. Of primary importance is the fact that they provide superior holding force when used on magnetic or electromagnetic chucks, small form tools or other work can be placed directly on the parallels, support bars are not necessary. The magnetic flux from the chuck is conducted through the closely spaced steel strips, actually increasing the holding force, and thus holding the work securely to the parallels and the parallels to the working surface of the



chuck. Parallels can be used on all four sides, opposite sides are ground parallel and adjacent sides at right angles, but cannot be used on their ends. The parallels come packed matched set of two in wooden box; each parallel is 1 x 2 x 4 in. **T-4-2252**

Threading Head

A six-chaser Lanco head has been recently developed by Landis Machine Co., Waynesboro, Pa., to meet the requirements for the precision threading of large diameter workpieces. This revolving die head is designed for application to the No. 4 Model C Landmaco threading machine and features a $2\frac{1}{2}$ to 6-inch pipe capacity and a $2\frac{7}{8}$ to $6\frac{5}{8}$-inch bolt capacity.

All parts of the massive constructed head are made of alloy steel. All operating parts are heat treated after machining and then ground to assure both threading accuracy and top wearing qualities.

According to company engineers, six chasers provide a 50-percent greater distribution of cut as compared to the

FRAY TOP SLIDES
DOUBLE MILLING RANGE
Fray NO. 10RH MILLING MACHINE
UNIVERSAL RAM • TURRET TYPE
• VERTICAL & HORIZONTAL
A Fray pays bigger production dividends by performing an unequalled range of milling operations. Both of the top slides on the Fray 10 RH are easily adjustable. This feature permits alignment of the turret slide with the table, thus doubling longitudinal and cross milling range . . . or you can just as simply set the turret at an angle to the table and mill in two directions. Combined, the turret slide and table slide provide 38" of overall travel, while the table cross slide, plus the ram slide permits a full 18" of in-and-out adjustment. This equals the overall range of much larger machines. Fray moves precision work faster at less cost.
Fray "All-Angle" Head TYPE 4
For deep, heavy cuts. Permits working to extra close limits. Any angle up to compound 2-way. Request Bulletin 4.
Overall Height 7 Feet
Write for details and specifications. Request Bulletin # 10
All-Angle
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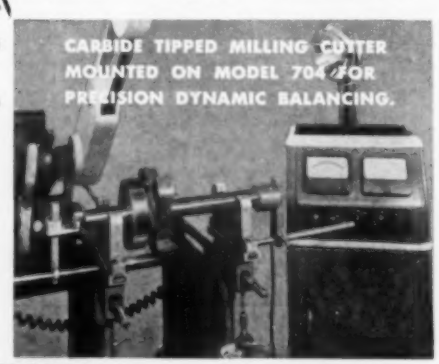
BUT...

VIBRATION due to unbalance is the reason carbide tipped milling and other high RPM tools do not go 2 to 3 times longer between sharpenings. **Precision dynamic** balancing of rotating tools not only pays back the price of the equipment, but also keeps downtime and set-up time at a minimum. Finish is improved and tolerances more easily held.



Because of its quick set-up and job-type characteristics, the **Model 704 Stewart-Warner Electronic Industrial Balancer** is excellent for precision balancing of tools and component machine parts weighing ½ to 1,000 lbs., as well as for balancing your finished product. Precision balancing in the tool field—tested, proved, accepted. For information, write

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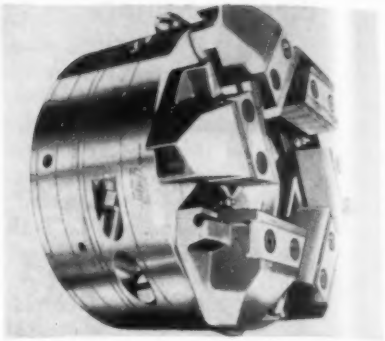


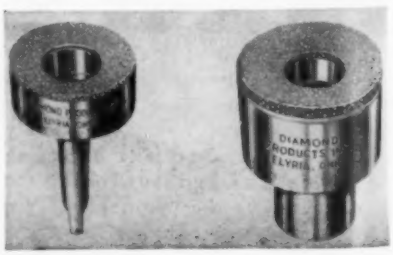
conventional four-chaser tangential die heads. A lighter chip per chaser means longer chaser life and higher quality thread, especially when cutting coarse pitch threads on large diameter work. In addition, greater support for the workpiece, freer cutting action, and elimination of out-of-roundness is provided.

The 6-inch Lanco can be equipped with an internal trip mechanism, a reamer, and a reamer attachment for the simultaneous threading, reaming, and chamfering of pipe and nipples. The reamer acts as a stop bar for the internal trip mechanism which provides constant thread length regardless of the differences in pipe or nipple length or in gripping position. Please send specifications when writing for additional information. **T-4-2261**

Lens Lapping Tools

Optical lens lapping tools, manufactured by Diamond Products, Inc., 335 Prospect St., Elyria, Ohio, are made in many different sizes depending on application and the particular fixture set-up to do the lapping.

Diamond powder of varied mesh sizes is impregnated into a powder metal matrix. The controlled manufacturing process in which these laps are produced assures the exact hardness of each lap, affording a uniform performance in each lap. With the use of powder metals, the diamonds are more securely held. Thus, since full utility of all the diamonds contained therein, a more economical lapping cost results. Thickness of the diamond impregnated section can be varied to meet specific applications. **T-4-2262**



Master Precision Level

Precision alignment, essential to exact application of parts, and as a factor in preventing excessive machinery wear, is offered by this master precision level, No. 59, manufactured by The Lufkin Rule Co., Saginaw, Mich. The ground and graduated vial of the tool is of ten second accuracy, with one division equalling 0.0005 of an inch per

foot. The special alloy base is less affected by temperature changes and the top plate is made of special nonconductive insulating material. Sensitive screws have 64 threads per inch for fine, positive adjustments. An auxiliary level shows lateral position.

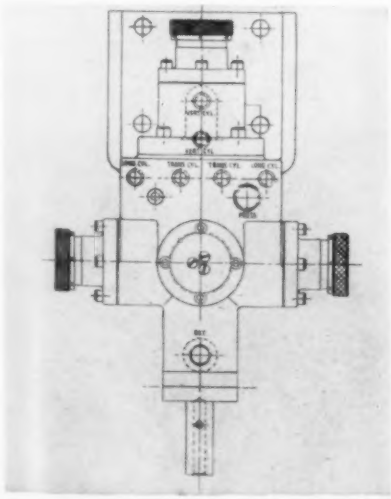
Made from thoroughly seasoned castings, it is designed to give maximum protection to the vials. Machined surfaces are scraped with extreme care, while nonmachined surfaces have durable black crackle finish.

Dimensions of the level are 15 inches in length, 3 inches in height, and 1½ inches in width. It weighs approximately 6 pounds. **T-4-2271**

Tracing Control Valve

The Trace Master, a high precision hydraulic control valve, has been developed by the Hydraulic Research and Mfg. Co., 2835 N. Naomi St., Burbank, Calif.

Incorporating pilot pressure valving, the Trace Master is especially simple to adjust to close tolerance work. This new unit has been especially designed for and is easily adaptable to vertical mills, spar mills, horizontal mills, boring mills and other machine tools suitable to contour machining. **T-4-2272**



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SAVE TIME! SAVE MONEY!

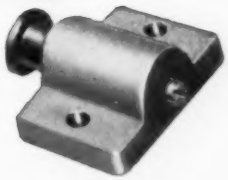
TOGGLE PADS

Toggle pads have 20° included angle of movement. Another Siewek exclusive is that they are available in National coarse and National fine threads.

TORQUE SCREWS

Over-tightening is impossible in the Siewek Torque Screw. Distortion of part piece is prevented by freely moving head when set pressure is reached. Dis-assembly for cleaning is simple.

SEE SIEWEK BOOTH 408 AT THE TOOL SHOW



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Sizes offer: Stroke from 3/16" to ¼". End Pressure—14 lbs. to 32 lbs.

SPRING PLUNGERS

Only Siewek has this exclusive feature in Spring Plungers—the hardened drill-rod nose.

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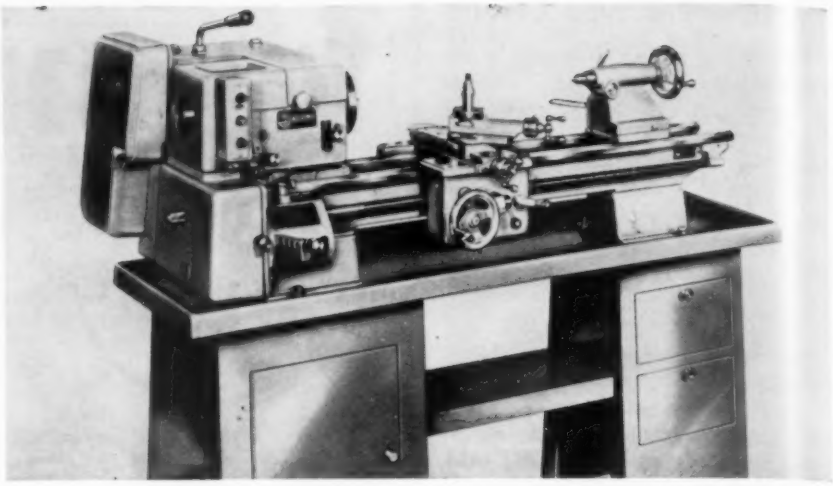


Heavy Duty Lathe

Features which provide greater accuracy, capacity and economy are offered in the Clausing 5300 heavy-duty 12-inch precision lathe announced by Clausing Div. of Atlas Press Co.

The unit has 1-inch collet capacity, a heavy-duty No. 3 MT tailstock with tang socket, 12-inch swing, twelve speeds, 9-inch cross slide travel, and 2¾ inch tool post travel—features that give it big tool and job capacity and wide work range.

Accurately built for close tolerance work, the lathe has a massive headstock and tailstock, and a heavy-duty bed and carriage for rigidity and stamina.

Included among features for greater efficiency and longer machine life are the built-in countershaft with friction clutch and brake, instant selection of 48 threads or feeds, automatic apron with splash lubrication, oil flinger spindle bearing lubrication, steel cable V-belt drive.

For illustrated catalog, write to the division, 5314 N. Pitcher St., Kalamazoo, Mich. **T-4-2281**

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Jar Bath

A full visibility Magni-Whirl jar bath made by Blue M Electric Co., 306-308 W. 69th St., Chicago 21, Ill., offers several features. According to the designers, 99.9 percent of the working space always is usable and there is 100 percent visibility.

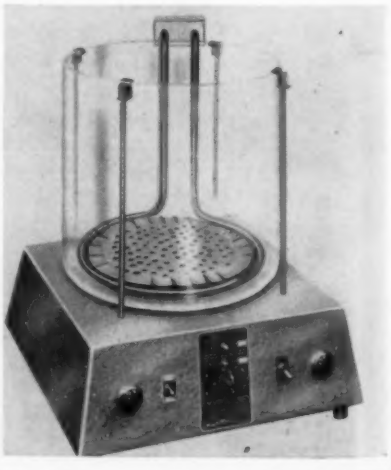
There is no need for any motors, stirrers or circulating systems, in this unit which provides uniformity and automatic, gentle, efficient agitation in all areas of bath irrespective of work load.

Uniformity and agitation are maintained by means of pulsation of the Magni-Whirl perforated agitator plate by a powerful electromagnet, located in base support. A selenium rectifier, capacitor, and timed relay actuate the magnet. The only moving part is the relay contacts.

Another important feature is the automatic dual microtrol which permits automatic selection of any two most used temperatures within range of bath. Other temperatures within the the range may be selected without disturbing the two preselected temperature settings. Controlled sensitivity is within plus/minus 0.100 C.

The Magni-Whirl jar bath is a self-contained, completely packaged unit. It comes in two temperature ranges, ambient to 70 C and ambient to 100 C and in three standard sizes (8¼ x 8 inches, 12 x 12 inches and 16 x 12 inches Pyrex Brand glass jar).

T-4-2282



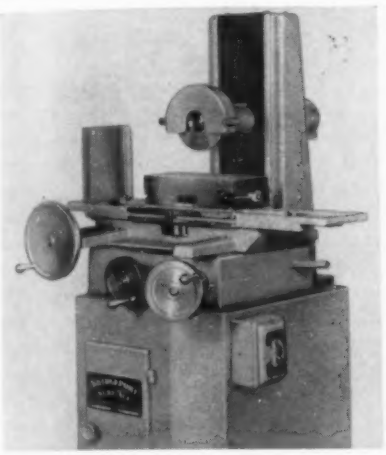
Surface Grinder

American Machinery Co., 315 Asylum St., Bridgeport, Conn., has announced a surface grinder, designated as the Bridgeport "Surf-Ace." It offers a 15-inch clearance under the wheel and a 6½ x 16-inch table travel.

The machine can be supplied with either a Pope, Ex-Cell-O, or Whitnon precision cartridge type spindle, and incorporate a cast iron base and hand-scraped vee and flat ways.

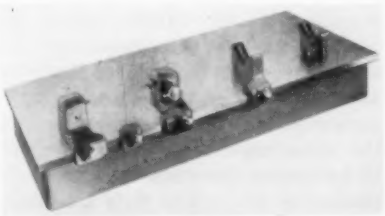
Designed to accommodate a standard 7 x ½ x 1¼-inch wheel, the grinder utilizes handwheels which are readily accessible for fast grinding and are graduated in 0.0001-inch increments.

T-4-2291



Inspection

An inspection device called the V-Liner inspection unit is being introduced at the ASTE Philadelphia Show by Swanson Tool and Machine Products, Inc., 816 E. 8th St., Erie, Pa. The



unit integrates all normal requirements of the inspection department in a single package. These units include a surface plate, adjustable bench centers, V-blocks, sine plate, indicator attachment and an exclusive concentricity checking fixture. **T-4-2292**

Portable Threader

Oster Mfg. Co., 2057 East 61st Place, Cleveland 3, Ohio, manufacturer of pipe threading equipment, is introducing a low-cost power drive for hand

pipe tools, called the No. 142 "Featherweight Champ."

Despite its feature of light weight—only 75 lb, which obviously permits its movement with ease—it is a powerful and sturdy machine. The unit is available with either gas or electric power, utilizes a ½-hp continuous duty universal, reversible, variable speed motor. Spindle speeds range from 22 to 36 rpm, variable with load.

A fully illustrated, factual booklet on the "Featherweight Champ" is available from the manufacture. **T-4-2293**

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High Precision DIAMOND COMPOUNDS
For critical production jobs—for dies, molds, tools and gages, Hyprez provides assured performance. Fast, free cutting action of pure diamond powders, exactly graded; permanent dispersion in scientifically formulated vehicles; continuous research and controls—these are your guarantee of finer finishes faster with Hyprez.
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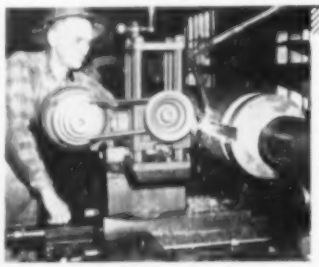
MASTER MACHINE TOOL ATTACHMENTS

Increase Production on LATHES, TURRETS, MILLS

1. 90° Universal Milling Head
2. Hi-Speed Milling and Drilling Head
3. Deep-Hole Internal Grinder Head
4. Basic Milling Unit
5. Milling and Grinding Table
6. Universal Feed Table
7. Internal Grinder Head
8. External Grinder Head
9. Slotting and Keyseating Head
10. Geared Dividing Head

Build Special Production Machines with Master Heads and Independent Feeding Mechanisms!

Save Time and Money by Relieving Your Independent Machines!

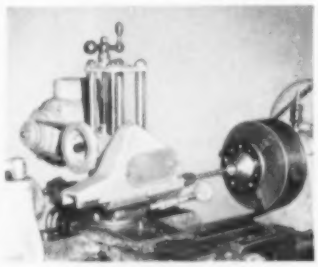


End Milling 2½" Keyway in 9⅞" Diameter shaft 22-ft. Long

The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, thread milling, boring, drilling, indexing, slotting, and keyseating, internal and external. Performs all operations for maintenance, tool room, and production at a minimum investment.

MASTER LATHE CONVERTER is available in four sizes:

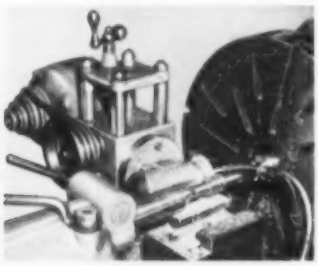
Model "C" ½ H. P. — 9" to 13" Lathes
Model "M" 1 to 3 H. P. — 18" to 72" Lathes
Model "B" ½ or ¾ H. P. — 13" to 18" Lathes
Model "H" 5 H. P. — 24" and Larger Lathes



Master Slotting Head on Lathe Cutting Internal Taper Keyway

THE REVOLUTIONARY NEW TURRET-MASTER is a small, compact, powered tool head for turret lathes, which powers the tool for either *on* or *off* center milling, drilling or boring, can be assembled for horizontal or vertical spindles. ½ 3 to H. P.

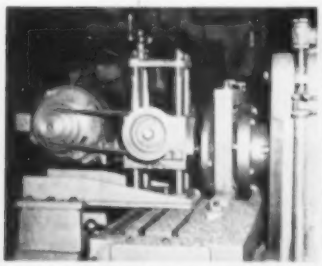
THE GEARED VERTICAL MILL HEAD amplifies operations of horizontal milling machines by combining independent power and double compounded swivel for angular positioning with capacities from ¾ H. P. to 5 H. P.



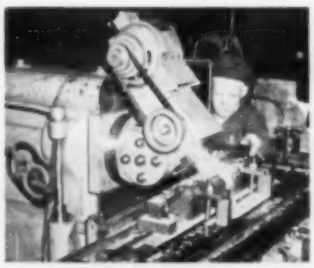
Thread Milling on a Lathe Internal or External

Outstanding advantages of these modern, easy-to-operate, supplementary tools are: (1) comparative low cost; (2) Greater number of operations can be performed in one set-up without resetting on another machine; (3) Can be used singularly, in a series, or grouped on basic lathes, milling machines, planers, or special fixtures; (4) Work can be either fed into the heads or the heads into the work; (5) All types of feeding mechanisms can be adapted for hand feeding, mechanically, hydraulically, or by air; (6) Convenience of a tool; strength and capacity of a machine; (7) Independently powered—twenty-four milling spindle speeds.

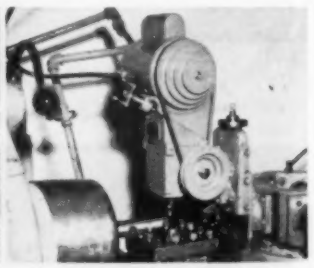
For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries!



Master Lathe Converter as Duplex Head on a Mill



Geared Vertical Mill Head on a Horizontal Mill



Turret-Master End Milling Keyway on a Turret Lathe

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Abstracts of Foreign Literature

By M. Kronenberg

Medium Lot Production

Only a relatively small number of machine shops are equipped for mass production methods thus requiring a limitation of the manufacturing program to medium-size lots.

H. Goebel discusses such problems in an article published in *Werkstatt und Betrieb*, January 1954. He indicates that it is possible to take advantage of mass production methods in medium-size shops. He suggests development of machining methods that would permit production of different parts simultaneously. In this way it is possible to distribute cost and labor over a greater number of parts. Special machinery of high output capacity can then be used.

The author has investigated a series of cases and presents examples covering the application of his principles to multiple-spindle drilling machines for general and special use respectively. The article is well illustrated and contains comparative cost analysis data for examples investigated.

Gear Testing Machine

A new gear testing machine, employing the principle of rolling master gear and test gears is described by F. Kirstin in issue No. 1, 1954 of the *Werkstatt und Betrieb*. The measuring accuracy of this device can be adapted to the requirements of various dimensions to be tested. By means of a small displacement of a slide it is possible to test gears to close tolerances. After readjustment of the slide the device can also be used for ascertaining the accuracy of gears cut to coarser tolerances.

Elliptical Spur Gears

A discussion of merit and disadvantages of elliptical spur gears by P. Grodzinski and O. Schlegel appeared in the same issue of *Werkstatt und Betrieb*. P. Grodzinski recommends replacing elliptical gears by spur gears mounted on eccentric shafts or bearings.

He claims considerable savings of cost and manufacturing time can be obtained, because of the heavy expense of machining elliptical gears. Although not all features of elliptical gears can be duplicated by a pair of eccentric gears, the authors hold that the difference can be reduced by using a gear train of several eccentric gears.

Determination of Surface Finish

Tests were made by W. Leyensetter to determine surface finish obtained under various machining conditions. He has measured the compression ratio and weight of the chips produced and reports on this investigation in issue No. 25, Vol. 94, pages 825-828 of *Zeitschrift des Vereins Deutscher Ingenieure*.

The author based his tests on the fact that chip compression ratio (that is the ratio of chip thickness to thickness of the undeformed stock on the work) varies with cutting speed and with distortion in the microstructure of the surface layer of the workpiece.

A series of turning tests was run on four types of carbon steels of two-inch diameter. The workpieces were subdivided into "fields" by small necks filled out with shim stock. The cutting speed could be varied between 400 and 3800 rpm by an infinitely variable speed drive. Three different grades of carbide tools were used and the chips obtained from each field were accurately weighed.

For a low carbon steel (German hardened C 15) the weight was a minimum at about 450 fpm surface speed, increasing slightly thereafter and remaining constant at higher speeds. The three other types of steel exhibited a different relationship between speed, weight and surface finish. The weight decreased consistently with increasing speed up to about 1000 fpm for steels C35 and St.60.11 (approx. equivalent to SAE 1045). The limit was at 600 fpm for St.50.11 steel (approx. equivalent to SAE 1035).

Running the same tools again at initial speed without regrinding them resulted in greater inaccuracy, indicating tool wear. In addition to weighing chips and determining compression ratio, the author has also made tests with the Leitz-Foster instrument, measuring roughness of surface produced. A decrease in roughness was associated with a decrease in chip weight, its compression ratio with increase in cutting speed up to about half the range of cutting speeds used. At higher speeds the Leitz-Foster instrument gave less reliable results, while a decrease in chip weight could still be observed. The conclusion was that chip weight may be a better means of indicating surface

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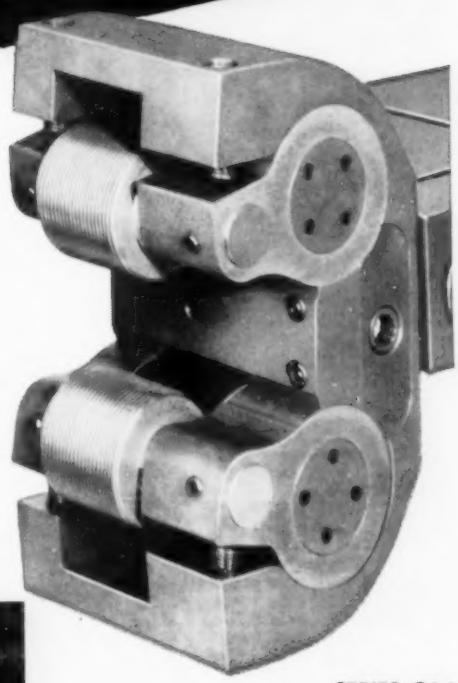
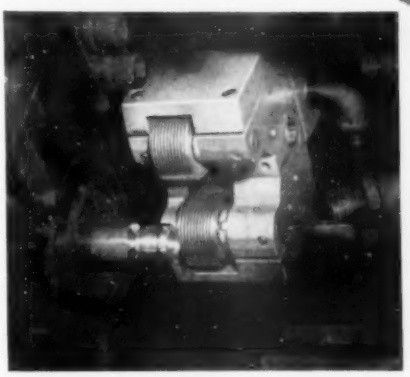
Four Standard Thread Rolling Attachments

For more than 100 Sizes of Automatics



Operating from the cross slides of automatic screw machines, each size is adjustable to accommodate an infinite range of work diameters within its capacity. Maximum thread rolling capacity within the tooling sector of over 100 sizes of single and multiple spindle automatic screw machines is possible through the selection of one of the four standard attachments.

SERIES G2A



Reed attachments have two opposed rolls which pass over the work when rolling the thread. They are easy to set up and rolls may be quickly changed and adjusted for size. A simple device provides precise matching of the rolls.

The attachment consists of two units, a head and an adapter. The heads are of compact rigid design and are assembled to an adapter by a floating swivel connection. Adapters are of the solid or adjustable type, and are designed for various cross slide positions on the automatics. A large assortment of adapters are available that permit more than 300 cross slide applications.

Send us specifications of your requirements and let us supply you with complete information.

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THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS
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NELCO CARBIDE TIPPED SLAB MILLS—

SET NEW PRODUCTION *Records!*

Machine Army Automatic Rifle Receivers in 1/3th the time . . . to better finishes . . . with 30 times more pieces per grind than conventional cutters!

An amazing story, but TRUE! Working on tough, scaly Perlitic Malleable iron castings, Nelco carbide tipped slab mills took a healthy .100 - .125 bite—a full 3½ inches wide—on a 3 horsepower machine at the incredible feed of 11½ inches per minute! Not only did the Nelco slab mills surpass conventional cutters in speed, *but produced better finishes, 400% more production per machine!*

HERE ARE ACTUAL PRODUCTION FACTS		
	High Speed Steel slab mill 80 RPM	Nelco carbide tipped slab mill 410 RPM
Feed (in/min)	1¾	11½
Production per machine	6 pcs. per hour	29 pcs. per hour
No. of pieces per grind	8	250 (average)
Finish	Wavy—needed extensive polishing	Superior machine finish—only minor polishing needed

Production test this amazing slab mill in your shop—Investigate NELCO today! This example is typical of the time-saving, money-saving benefits users report when using Nelco carbide tools. With nearly 800 tools regularly stocked, you can order —and GET—"special" tools at standard prices.

For full information on the *complete* Nelco line, send today for 48 page catalog.

NELCO TOOLS — For that Extra EDGE in Production

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

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finish than the Leitz-Foster instrument because its stylus fails to enter the fine surface serration produced at high cutting speeds.

The author attributes this relationship between speed, surface finish and chip weight to the reduction in the length of the gap ahead of the cutting edge. Although the existence of such a gap is disputed by others, Leyer-setter claims that it does occur. He states it is reduced at higher speeds, thus resulting in less weight and less compression of the chip than at lower speeds.

Cylindrical Grinding Cooling

Numerous tests run by G. Pahlitzsch and J. Appun have investigated the effect of simultaneously supplying coolant from the outside and inside to the grinding wheel. They report their findings in an article in issue No. 11, 1953 of *Werkstattstechnik und Maschinenbau*. Good results were obtained by supplementing traditional method of outside emulsion cooling by supplying a small amount of oil of a few ounces per minute to the grinding wheel from the inside.

Grinding wheel wear, surface finish and metal removal by this duplex process were somewhat inferior to an outside cutting fluid of oil. The new supply method was superior in improved cooling effect and the elimination of the oil fog associated with the outside oil supply method. Oil fog frequently interferes with the operation of machines. The authors present a cost analysis indicating substantial savings in comparison with usual methods

Coating by Electric Spark Method

G. Barna reports in Vol. 5, No. 1 of the *Hungarian Abstracts* on investigations made with a vibrating tungsten carbide anode for producing deposits of this metal on either high-speed steel or carbon steel shanks. The process is inexpensive using the tungsten carbide in parallel with a condenser in a d-c circuit and the shank as a cathode which is slowly traversed beneath the anode. The discharge is so regulated that only sparks are produced and no electric arc. The layer produced in this manner is thin but hard. The bonding is perfect and probably diffusion-like.

Tool life was about five times the tool life commonly obtained with comparable tools. At present it is not intended to replace carbide tips by deposition of tungsten carbide on tool shanks of simple turning tools. The process will render excellent service where tungsten carbides could not be used before, due to complex contours of the tools.

Field Notes . . .

Establishment of the Carter Achievement Awards for excellence in hydraulic and pneumatic cylinder design applications, has been announced by Carter Controls, Inc. Entries may consist of any new, unique or unusual application of one or more pneumatic or hydraulic cylinders, which can be shown to be of tangible benefit. Deadline is December 31, 1954. For more information, address the Carter Achievement Awards, c/o Carter Controls, Inc., 2800 Bernice Rd., Lansing, Ill. Eligibility includes everyone except employees of the company and their immediate families.

V V V

News and features on universal joints from case history data to engineering suggestions will be the material contained in a new periodical published by the Joint Div. of The Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich. To receive regular issues or current, write directly to the company.

V V V

Aiming at familiarizing management, shop men and dealers with reasons for stabilizing moisture content of stainless steel and low hydrogen electrodes, the Fred C. Archer Co. has announced publication of a new periodical called *Welding Views*. The first issue of the magazine carries information of a contest for the best letter on the use of the Aridair Stabilizer. Both dealers and users are eligible to try for the $100 prize. Contest closes April 15. Details may be had from the company 606 W. Wisconsin Ave., Milwaukee 3, Wis.

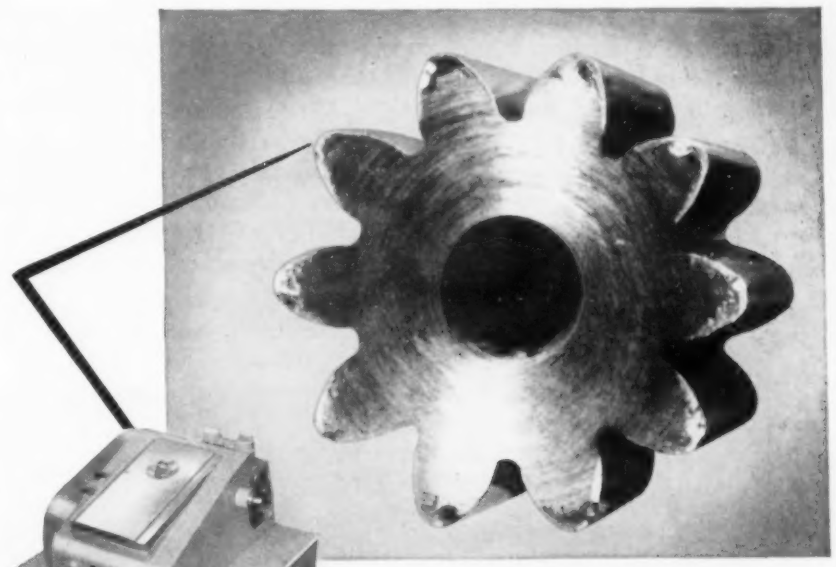
new lines

Allis-Chalmers Manufacturing Co., in celebrating the 50th anniversary of its Norwood Works, has announced its new line of electric motors conforming to the industry-wide program being carried on by NEMA regarding rerating of motors. Although not yet on the production lines, these motors generally will have twice the horsepower capacity of previous motors, based on frame sizes. Also, weight per horsepower will be greatly reduced. For instance, the new 2-horsepower motor will weigh 80 lb whereas the standard motor it replaces weighs 106 lb, a 25 percent reduction in weight.

Unground braze-type mandrel nibs of cemented carbide for drawing steel, aluminum and other tubing materials are being offered as a standard line by Carboloy Dept. of General Electric. Seventeen diameters are included in the stocked line, designated MN-450 to MN-1250.

V V V

The Mathewson Corp. of Inglewood, Calif. has announced its entry into the field of special valves. Experienced in the field of metal fabrication and manufacturing of special sealing parts, the firm now branches out to include design with its recently acquired rights to newly developed, sealing methods. At present, the company is concentrating



NOW'S THE TIME FOR A Burr-Master*

Yes, when your production gears need deburring and chamfering your answer is a Burr-Master. Capable of chamfering the entire tooth form and root, Burr-Masters are available in a wide range of models to meet every need.

No matter what the length of your production runs or the size gears to be chamfered, the Universal Burr-Master (shown) holds the answer to many of your finishing problems. The newest member of the Burr-Master line, it handles both spur and helical gears as well as straight and involute form external splines.

Complete details in Bulletin 103-60. Ask for it.

*Reg. Pat. Pending

MODERN Industrial Engineering Co.

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For better screw threads at lower costs per thousand pieces

on automatic screw machines, turret lathes and other machines

CONSIDER THIS:

THE H & G Insert Chaser Automatic Die Head differs in design and construction from all other die heads. It is unique, without a counterpart, in a class by itself.

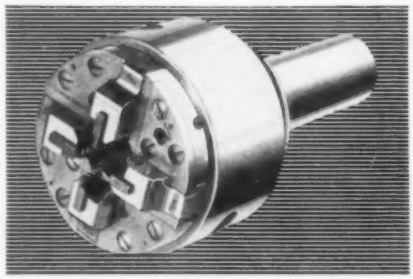
It employs small, low cost chasers as opposed to conventional and so-called long-life chasers. The latter, in the hands of a good mechanic, expert in grinding, give good results. But, cutting threads in this way can be compared to shaving with an old-fashioned, long-bladed, straight-edge razor; a good tool in the hands of a barber – *but not the average man.*

H & G Insert Chasers can be compared to low cost but highly efficient blades used in modern safety razors. They are so cheap that they can be thrown away when dull, or for utmost economy, can be sharpened again and again. With our new grinding fixture, anybody can do a beautiful job. Only a flash grind is required. Girl operators replace a dull set in two or three minutes without sending for a set-up man.

If threading to Class 3 specifications is troublesome, you would do well to change to H & G Insert Chaser Automatic Die Heads. They cut downtime to the minimum, keep machines humming and produce smooth, accurate threads.

Write about the possibility of a 30 day trial* giving the *make, size* and *model* of machine and the *thread size* and kind of *stock.* See what H & G Die Heads will do for you under your conditions.

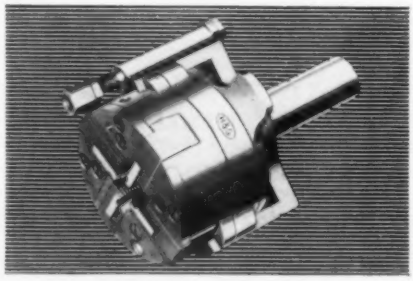
Ask for our bulletin entitled "SELECTING THE PROPER DIE HEAD FOR THE JOB".



ABOVE – *Style MM for multiple spindle automatics, chucking machines, drill presses.*

NOT SHOWN – *Style DMS for turret lathes.*

BELOW – *Style DM for B & S automatics and small spindle machines.*



*Standard size Die Head and subject to acceptable credit rating.

THE EASTERN MACHINE SCREW CORPORATION 27-47 Barclay Street New Haven

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on swing and disk type check valves, vent, line, etc., especially designed for high temperatures, synthetic oils, fuels and chemicals.

V V V

Development-engineering, process-development and consulting are the services offered by the newly established R. M. Reichl Co. which opened offices at 110-11 Seventieth Rd., Forest Hills, L. I., N. Y. The company was organized by R. M. Reichl, formerly vice-president of Hydropress, Inc.

acquisitions

The Warner & Swasey Co. of Cleveland has revealed the purchase of the business and assets of Industrial Scientific Co. of New York, and the formation of The Warner & Swasey Research Corp. to carry on, in expanded form, the work of the acquired firm. It is expected that the activities of the new company will be expanded promptly to new projects in the fields of machine tools and textile machinery, the field in which the parent company is active.

Officers of the New York company are Charles J. Stilwell, chairman; William S. Tandler, president. Mr. Tandler has been operating head of Industrial Scientific Co.

V V V

The business formerly operated as Air-Line Engineering Co. has been taken over by Airlenco Inc. According to the announcement, the same equipment, with some additions to the line, will be produced.

V V V

Announcement has been made of the purchase of the former Chapman-Price steel plant in Indianapolis by Heppenstall Co., steel forgings manufacturer. Price of the transaction is reported at $500,000. The newly acquired plant consists of six manufacturing buildings and an office building. Operation is expected to begin at the Indianapolis plant in 15 months. Key personnel will be transferred from the Heppenstall's present plants, with the balance of the labor force recruited in the Indianapolis area.

V V V

Purchase of Modern Tool Co. of Berlin, Conn., has been announced by The Nelco Tool Co. An increase of 30 percent personnel and addition of 5500 sq ft of manufacturing area complete with modern equipment was accomplished by the acquisition. The new

pany will continue to operate and market the present line of Modern Tools under that name, although the organization will be known as the Modern Tools Div. of the Nelco Tool Co. William A. Coe has been named as general manager of the division, while Hans Nelson, former president of Modern Tool will continue with the firm in an advisory capacity.

V V V

Jessop Steel Co. disclosed it is making a drive for business in three states with acquisition of the Jessop Steel Sales Co. of Detroit, an independently-owned warehousing organization which had the sales franchise for Jessop Steel products in Michigan. According to Jessop president Frank B. Rackley, the Detroit company's operation will be expanded to include distribution of the company's products in Toledo, Cleveland, and Chicago. It will operate as a division of Jessop under the direction of John R. Harbaugh, assistant vice-president in charge of sales.

name changes

The corporate name of Miller Motor Co. has been changed to Miller Fluid Power Co. according to notice issued from that firm. According to the statement which made the name change public, this does not involve any alteration in company ownership, products, management, personnel or policy. Reason given was that the new name more accurately describes the company's activities and products.

V V V

Diversification of products and engineering activities has brought about a change in the name of Scintilla Magneto Div. of Bendix Aviation Corp. Henceforth, "Magneto" will be deleted and it will be known as the Scintilla Division.

expansions

Completion of a new ultra-modern metal treating plant for Metallurgical Inc., in Minneapolis, Minn., was marked recently with an opening celebration attended by more than 1,000 persons from all parts of the country.

Included in the new facilities is a pit 100 by 15 by 14 feet which houses a heavy duty electric furnace having a capacity of 6,700 pounds per load, which will be used for bright annealing, normalizing and carburizing. In addition, the pit holds two atmosphere-controlled, radiant tube gas fired furnaces with a capacity of 4,300 pounds per load each. An electric furnace of 4,100 pound capacity and a tempering furnace complete the number of furnaces in the pit. An entire section of the plant is taken up with a generator to provide protective atmosphere. This equipment is representative of other up-to-the minute facilities for metal treating. For example, units housed in another, smaller pit include a Microcarb furnace for carbon restoration; a Neutralene generator to provide protective atmosphere for pit-type, automatic hardening and brazing furnaces; a Cyclone draw furnace for drawing and tempering previously hardened steel and aluminum parts.

An inspection department carries on continuous checking of the plant output, while a metallography laboratory under the direction of two metallurgists is equipped for full extensive research and quality control work.

V V V

Completion is expected shortly of the plant for the fabrication of precision silicone parts which has been un-

"WHERE *can I get* **U**

ALL *types of* **PLASTICS** *for* **TOOLING?"**

1 *TOOLPLASTIK non-shrinking phenolic casting resin for producing tools and models quickly and economically.*
2 *DYFORM reduces cost, weight and lead time in production of high impact tooling.*
3 *L-900 series non-shrinking laminating resins. 50% cost savings on laminate jigs and fixtures.*
4 *L-930 NON-SHRINK surface casting resin (metallic) for facing metal tools–form blocks–core boxes, etc.*
5 *CORFOAM–a foam material for tool core and model structures and high heat applications.*

For further information contact...

Rezolin, Inc.

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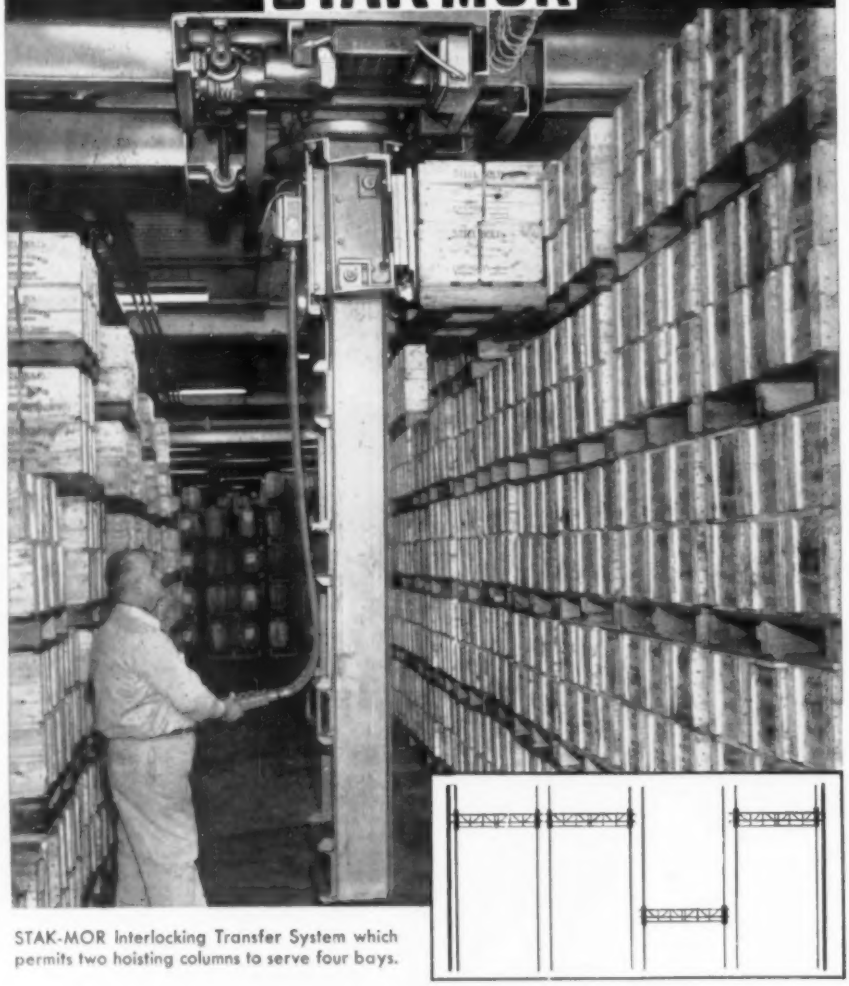
85% More Storage Space with CHICAGO TRAMRAIL STAK-MOR STORAGE SYSTEMS



STAK-MOR Interlocking Transfer System which permits two hoisting columns to serve four bays.

The Chicago Screw Co. increased pallet storage over 85% in the same storage space in each of four bays with STAK-MOR Crane System, storing 2100 pallets in the same space formerly required for 1120 pallets.

The Chicago Screw Co. also saved many man hours due to the simplicity and maneuverability of the STAK-MOR System which allows accurate placing of materials in and out of the storage area.

The original installation served an approximate area of 9,000 sq. ft., with an interlocking transfer system which allows the movement of the hoisting columns from one bay to another. Due to the extreme flexibility of STAK-MOR Systems, additions can be readily made in most installations. Since the original installation, The Chicago Screw Co. has added a fourth bay which interlocks with the three previous bays.

This system is an under running transfer system; however, STAK-MOR Systems can also be furnished as top running or self-contained systems operating on rails mounted directly on top of the racks.

ASK FOR COMPLETE INFORMATION... descriptive catalog, pictorial record of various applications and engineering data.

CHICAGO TRAMRAIL CORPORATION
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der way by the Goshen Rubber Co., Inc., Goshen, Ind. Facilities and departments in the new plant include presses, mills, extruders, curing ovens and trimming.

V V V

Facilities at Mobile (Ala.,) Alumina Works of Aluminum Co. of America are now completed, increasing capacity of the plant by 33 percent. The expanded works will now make available sufficient alumina to produce more than 100,000 tons of aluminum metal per year. Equipment added at Mobile involves all requirements for refining ore under the Bayer Process, including a digester unit, filter presses and precipitators and a calcining kiln. A new storage building was also erected to handle supplies of ore.

V V V

Third major plant expansion in the past four years has been completed by John Volkert Metal Stampings, Inc. The new building houses executive offices, conference facilities, an apprentice training section, the production welding department and a new finishing room.

V V V

Severance Tool Industries, Inc., which recently opened an Eastern Plant in Westbury, L. I., N. Y., now has announced expansion of the main plant at 728 Iowa St., Saginaw, Mich. The addition increases manufacturing floor space by 2000 sq ft.

V V V

Third expansion of its operation in the past eleven years has been completed by Adamas Carbide Corp., which has just moved into its new million-dollar plant on Garden State Pkwy. in Kenilworth, N. J. Increased production by 50 percent is expected from the new facility which incorporates the latest production and quality control developments.

new offices

Recent establishment of a new sales office and warehouse in Detroit has been announced by Metal Removal Co. The step was taken, according to the firm's president, Charles E. Davis to facilitate operations in that heavy industrialized area.

V V V

Creation of a wholly owned subsidiary, Standco Canada, Ltd., in Toronto, has been revealed by Standard Pressed Steel Co. of Jenkintown, Pa. Standco Canada will function as a selling, warehousing and distributing concern, serving industrial Ontario and Quebec provinces. General manager of the

Toronto subsidiary is James P. Price, also a vice-president. With this step, the company feels it is putting factory-trained personnel within easy reach of Canadian distributors and customers firms.

V V V

A new division, responsible for designing industrial dust collection and fume elimination systems, has been added by Mars Engineering, Inc., 375 South St., Newark 5, N. J. The addition is expected to meet a double need —one by industrial manufacturers using processes which create dust or fumes, and the second by fabricators and installers of sheet metal hoods and duct work who are not equipped to provide design services for customers.

V V V

Opening of an office in St. Paul, Minn., has been revealed by Latrobe Steel Co. The new office, to be operated by James Terry, will serve Minnesota, North and South Dakota, Nebraska and northern Iowa.

V V V

Opening of a new Southern California office and warehouse at 5276 Atlantic Blvd., Maywood, Calif., has been announced by R. & J. Dick Co., Passaic, N. J. This is the third such service center on the west coast for the company which previously had established facilities at San Francisco and Seattle.

broadened services

Expanded production and improved processing methods are reflected in announcements from two titanium producers concerning price reductions.

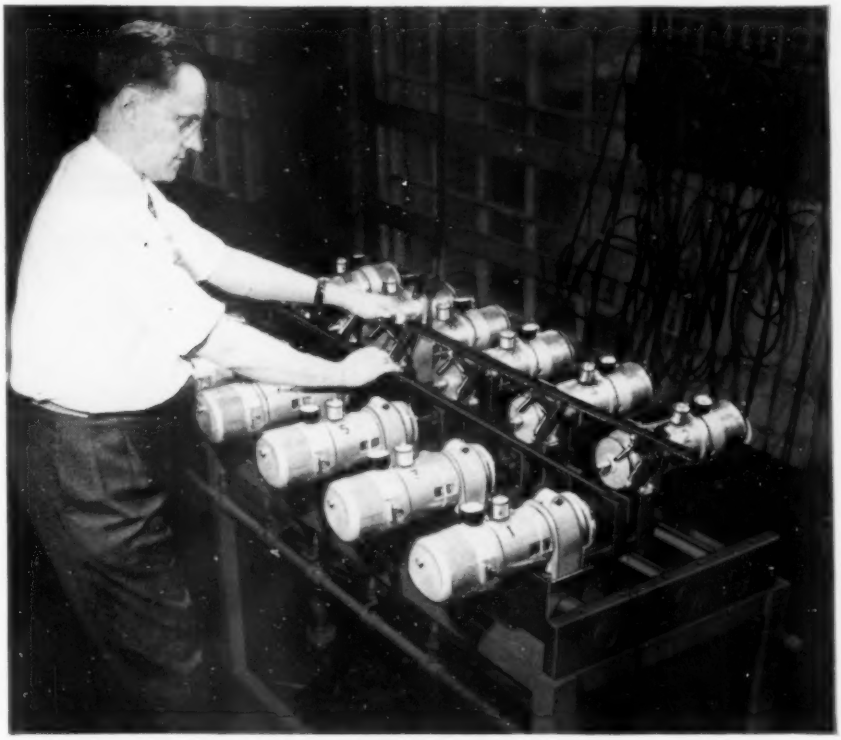
Titanium Metals Corp. of America announced an overall average decline of over 12 percent for commercially-pure sheet and plate, adding that they were repricing downward some $2-million worth of orders now on their books in order to extend the benefit to all customers.

Rem-Cru Titanium, Inc. similarly announced reductions, ranging up to 14 percent, on various products including bars, billets, sheet and plates. The company indicated reductions depended upon grade, product, size and quantity.

V V V

Having recently adopted a code of ethics seal to identify equipment of quality, the Gas Appliance Manufacturers Association is now launching a concentrated campaign to foster wide-

58 semi-automatic setups with ONE BASIC UNIT



Alternately opposed Drill Heads — with a work locating jig — mounted on a movable bracket. With two pieces loaded, each Drill Head produces a half hole cavity in each piece. Thus, in each 12-second cycle, 24 cavities or 12 holes are produced.

Dumore Automatic Drill Heads put carbide drilling of fibreglass, aluminum — on a production basis

THIS job involved drilling 12 cavities (1/16" radius), at various spacings from 1-3/8" up in each of 35 different lengths of 3/8" fibreglass rod. It required a drill head with spindle speeds high enough to use a carbide drill for the highly abrasive fibreglass. Mass production seemed out of the question.

However, with a relatively simple unit (see photo caption)—consisting of 12 Dumore Automatic Drill Heads with spindle speeds of 7500 rpm — this manufacturer *is* mass producing. In 2000 hours he produces 10,000,000 cavities . . . and what's more . . . by merely changing jigs, he gets 23 additional setups to drill various sizes of aluminum tubing!

Here's just one of many cases in which the exceptional adaptability of Dumore Precision Tools provides a simple solution . . . at relatively little cost . . . to otherwise extremely difficult problems. If you want to know where and how Dumores can help you, contact your Industrial Distributor or write:

DUMORE PRECISION TOOLS

The Dumore Company

1325 Seventeenth Street • Racine, Wisconsin

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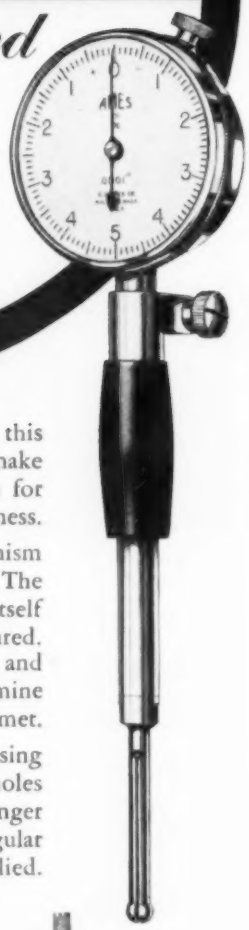
AMES

... the Preferred

FOR FAST, ACCURATE INSPECTIONS

Small Hole Gauge No. 36



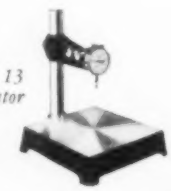
Skilled and unskilled employees can use this superbly designed two-point contact gauge to make quick, accurate, *impersonal* inspections of small holes for size, taper and roundness.

The Ames No. 36 has extremely sensitive mechanism especially designed to eliminate "feel" in measuring. The spherical contact point automatically centers itself and indicates the true diameter at the point measured. The operator has only to slide the contact in and around the hole and note the readings to determine if tolerances are being met.

The Ames Small Hole Gauge No. 36, using contacts in increments of 1/32", can check holes of 3/16" to 1" diameter, up to 2" depth. Longer lengths and special contacts to check irregular recesses, splines, etc., can be supplied.

Ames No. 15 Jaw Gauge

Ames No. 13 Dial Comparator



Ames No. 516 Dial Micrometer

Ames No. 25 Pocket Thickness Measure

If you would like to have our recommendations on your measurement problem, send blueprints and specifications. Write for your free copy of catalog on Ames precision measuring instruments.

Representatives in principal cities. B. C. AMES CO. *30 Ames Street Waltham 54, Mass.*

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spread recognition of the seal and its meaning. The seal was adopted to symbolize highest standards of safety, performance and durability and to give assurance to users that such equipment had been manufactured on sound engineering principles by reliable manufacturers.

V V V

Authorization for the preparation and publication of a textbook on "Fundamentals of Tool and Die Making" has been granted by the board of trustees of the National Tool & Die Manufacturers Assn. The book is to be used in the association's nationwide apprenticeship program.

sales

Position of sales manager of the recently created Industrial Division of The Weatherhead Co. has been filled by the appointment of Lester J. Henderson. In this capacity, Mr. Henderson will direct selling activities for the company's entire line of industrial products.

V V V

B. C. Ames Co. has made J. B. Morrison Machinery Co., Ltd., 45 Oriole Parkway, Toronto 12, its exclusive Canadian representative.

V V V

Western New York territory has been placed under the charge of Bruno D. Hendrickson, abrasive engineer, according to Norton Co. announcement. Mr. Hendrickson formerly was an engineer in the company's sales engineering department.

V V V

Mrs. Leonard Smit, who is now president and chairman of the board of Anton Smit & Co., Inc., succeeding her late husband, founder of the firm, has appointed Daniel S. de Rimini to fill the post of general sales manager. Mr. de Rimini, a native of the Netherlands, is well known in American industry, particularly the automotive and aircraft manufacturing fields.

V V V

Kel-Sir Co., 2700 W. Concordia St., Milwaukee, Wis., has been made the manufacturer's agent for Taft-Peirce Manufacturing Co. for the state of Wisconsin.

V V V

A midwest sales territory which includes the states of Wyoming, Utah, Colorado, Nebraska, Kansas, Missouri and parts of Illinois, Kentucky, Tennessee, Mississippi and Arkansas, has been established by Morse Chain Co. C. B. Lane, formerly with Noelling Steel Sales Corp., will head the new sales office in Overland Park, Kans.

Technical Shorts...

RESEARCH ON aluminum alloy fabrication at Harvey Aluminum has led to development of 66S which that company's scientists believe will offer important structural cost and weight savings. These advantages are expected to hold true particularly where use of a strong, lightweight material is desirable at reduced cost. This discovery of 66S offers a bridge between lower strength of 61S and higher strength hard alloys 24S and 14S, which are more expensive.

Aluminum Alloy Offers Economy

Particularly significant is the weight savings possible with the new type since structural elements of thinner cross section will be expected to do the same job as thicker (and therefore more expensive) sections of lower strength alloys. This same characteristic of high strength at comparatively low cost will cause it to find practical use in many industries.

Yield strength of the newly fabricated metal is 45,000 psi which gives it several structural advantages. Structural steel, for example has a yield strength of 33,000 psi. Fabricating characteristics are said to be practically identical with that of lower strength 61S as are its corrosion resistance qualities. At the same time, its guaranteed tensile and yield strengths are 31 percent over 61S alloy. Specifically, the tensile strength of 66S is 50,000 psi for material up to ¼ in. thick, while its yield strength is 45,000, and elongation is 8 percent.

* * *

FIVE PERCENT beryllium in iron has created a master alloy which its fabricators, The Beryllium Corp., announce as a new product, designed as an answer to increasing demands on the part of ferrous producers for beryllium additions to stainless steels. The ferro-beryllium master alloy, already in commercial use, is valued chiefly for its contribution to the hardenability of stainless steel, already having proved itself a success as a vital part of newly developed hardenable 18-8 stainless steel alloy known as V2B.

Hardened Stainless Alloys

This new stainless alloy has been perfected by The Cooper Alloy Foundry Co., Hillside, N. J., and includes among its prime features not only an excellent hardenability feature but high corrosion resistance and nongalling properties as well.

Previous attempts in the past to add beryllium to 18-8 stainless alloy proved impractical when high hardness advantages produced were negated by such drawbacks as extreme brittleness and too high a hardness in the quench-annealed state for good machinability.

Already successful in the stainless castings field, the master alloy is also being developed for use in the field of wrought stainless products.

* * *

AUTOMATIC MEASUREMENT of two variable conditions is possible with a new electronic instrument which does the measuring and, after obtaining it, goes on to simultaneously plot their relationship to a third consideration. Essentially a research tool, the instrument probably will find considerable use in a wide range of industrial research activities. For example, in

Curve Plotting By Electronics

Lamina

GUIDE PIN BUSHINGS
with exclusive bronze-on-steel design

Gone are the headaches and high costs of bushing failures in your die sets when you install Lamina Guide Bushings.

Exclusive design*—long-wearing hardened steel with free-running bronze on the I.D.—adds thousands upon thousands of press strokes to the life of Lamina Guide Bushings. This means important savings both in maintenance costs and lost production time for bushing replacements.

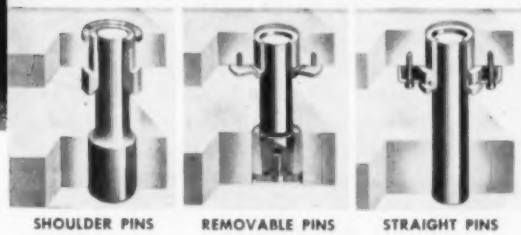
Even more important, with their precision running mates—Lamina pins—these guide bushings consistently boost die life through better die alignment. This means more parts per die sharpening, better quality parts, lower cost per part. Big savings all around.

As illustrated at left, Lamina Bushings come in three styles and all popular sizes. Specify them when ordering die sets. Contact any die set manufacturer or write direct to us for our new free illustrated bulletin and price list.

*Patent Pending

SPECIFY Lamina GUIDE PINS, TOO!
. . . for precision . . . for longer life.

Lamina Guide Pins are available in the three styles shown and in all popular sizes. Like Lamina Guide Bushings they are ground to gage-maker's precision. Made of water-hardening tool steel, they wear longer and eliminate "Mushrooming" when assembled in the shoes.



Lamina DIES AND TOOLS, INC.

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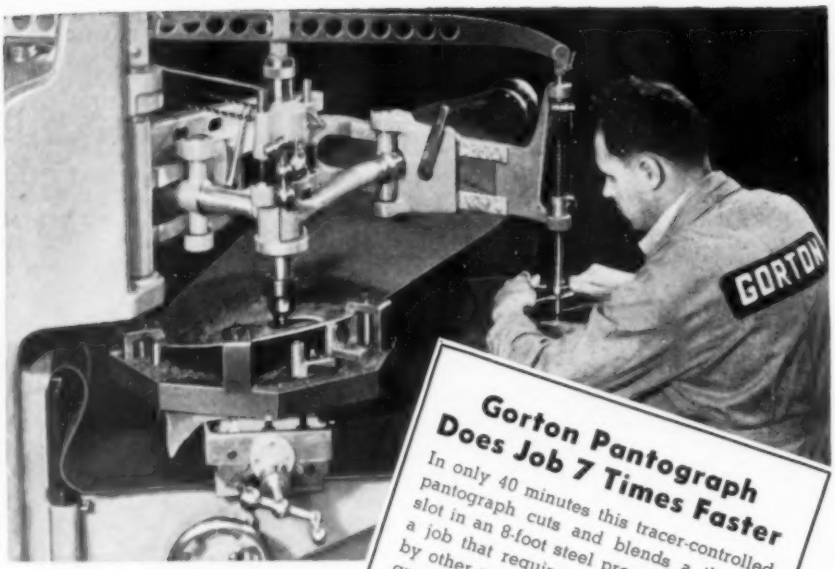

Gorton Pantograph Does Job 7 Times Faster

In only 40 minutes this tracer-controlled pantograph cuts and blends a thermal slot in an 8-foot steel propeller blade — a job that requires 5 hours 10 minutes by other methods. This is typical Pantograph performance — one of hundreds of examples.

Gorton Pantography Brings *Creative* Production to Your Plant

What's *your* problem in machining? Depend on Gorton Pantography to help you *create* a new production method if your problem falls into any of these categories:

OPERATIONS

Inside profiling	Counterboring
Outside profiling	Chamfering
Routing	Grooving
Die sinking	Graduating
Mold cutting	Engraving

MATERIALS
Ferrous metals
Non-ferrous metals
Plastics

SHAPES
Flat
Uniformly curved
Cylindrical
Square
Spherical
Irregular

Gorton Pantography works in two or three dimensions, in all directions on a horizontal plane, and vertically. It uses enlarged masters, templates or patterns — easily and inexpensively made. Normal operation takes advantage of the reduction ratio principle for increased accuracy in the work piece — an exclusive pantograph benefit.

Whether a dozen or a thousand pieces, each is identical in shape and tolerances to the first. Operation during cutting cycle is manual or automatic, and work piece size varies from the diameter of a dime to areas as large as ten feet.

Clip the coupon for your copies of the Gorton catalog and the helpful booklet, "Pantography."

GEORGE GORTON MACHINE CO.

Please send at once complete information about the Gorton line contained in Bulletin 1655-2604

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2604 Racine St., Racine, Wis., U.S.A.

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aerodynamic research, the tool can plot vibration amplitude and discharge pressure vs speed, or dynamic pressure and yaw angle vs immersion depth.

Called the Electronik Duplex Function Plotter, the instrument incorporates three complete measuring and balancing circuits. Two of these actuate recorder pens horizontally across a specially calibrated chart to record two conditions, while the third circuit motivates the instrument chart vertically as it measures the third variable. Result is a continuous automatic plotting which evaluates the two initial variables in terms of the third. Any d-c source can actuate the three circuits which can be calibrated for the same or entirely different ranges and actuations. As an example, one pen may record temperature, the second, speed and the third pressure with the chart measuring circuit calibrated in millivolts.

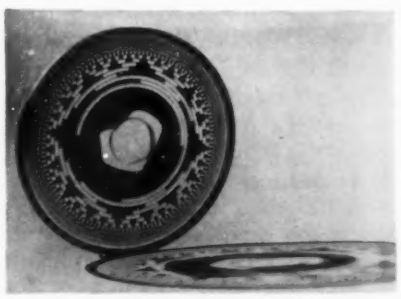
Utilizing the instrument, measurements are automatically compiled and the curve continuously plotted.

* * *

Code Wheel On Glass

PATTERN FOR a digital code wheel has been successfully placed on glass by W. & L. E. Gurley, Troy, N. Y. The wheel pattern, containing 13 concentric rings of alternating opaque and transparent sectors is only 5½ inches in diameter. The number of sectors per zone increases by doubling to 2^{12}, or to 4096 in the outer zone. Gurley was able to make the divisions in the outer ring less than 0.1 inch long and 0.04 inch wide.

The code wheel will be used in a



binary code transducer system, which will supply data by rotational position of an instrument shaft to digital computers used in various military applications. The method of marking blanks by photographic methods has unlimited possibilities in reproduction of irregular patterns spaced at closely controlled regular intervals. This will supplant previously attempted methods with conventional dividing equipment.

The code wheel pattern on glass will

make it possible to encode analog data more accurately and simply than by other methods.

In actual use in encoding, one of the code wheels is mounted rigidly on an instrument shaft, and light is passed through the wheel and a slit to phototransistors.

Computers used with the code wheel are based on a binary, rather than a decimal system. In any position, the arrangement of opaque and clear sectors in the annular zones represents a specific binary number. It is possible to read a total of 8192 number codes, which enable determination of accuracy of shaft position to approximately 2.5 minutes arc. As a prevention against ambiguity, the so-called "Gray code"—a special binary system—is employed.

* * *

Improved Circuit for Amplifiers

Naval Research has revealed the most recent advance in magnetic amplifier development.

It involves a fast-response circuit which does away with the need for a rectifier in the control circuit and thus permits freedom in selection of core materials.

With input signals on the order of 10^{-6} watts and half-cycle respone, power gains of several thousand have been achieved with a single-stage amplifier.

* * *

Films Available From Industry

Several industrial movies recently made available to the trade not only serve to further company products but offer valuable technical information.

Latest developments in light-metal brazing techniques are demonstrated in the 22-minute 16 mm sound film "New Horizons in Aluminum Brazing" offered by Aluminum Co. of America, Motion Picture Section, 854 Alcoa Bldg., Pittsburgh 19, Pa. This color movie gives a comprehensive view of the advantages brazing provides in design and fabrication of aluminum products. It also explains in detail the various basic aluminum brazing methods.

Another 16 mm color sound film, just completed by Monarch Machine Tool Co., Sidney, Ohio, deals with the technical aspects of modern lathe production. Avoiding the commonly used pictorial plant tour, this movie, "The Turning Point," selectively shows development of new equipment designs. Quality control methods utilized in building a line of turning machines are included among the various phases of modern production stressed in this film.

Instant Automatic Flow and Shut-Off

Quick Connection and Disconnection

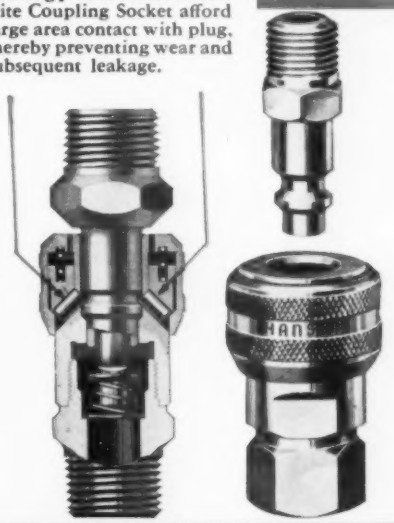
WHY *Genuine* HANSEN COUPLINGS GIVE BETTER SERVICE LAST LONGER

LEAK-PROOF, Minimum Wear Locking Device

Integral Factory-Assembled Tamper-Proof Socket Head

PICK GENUINE HANSEN COUPLINGS FOR HANSEN PERFORMANCE...

Locking pins in Hansen Push-Tite Coupling Socket afford large area contact with plug, thereby preventing wear and subsequent leakage.



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● The ability of Hansen Push-Tite Couplings to withstand severe service—with practically no maintenance—has been thoroughly proved by years of hard everyday use in thousands of plants. The "socket head", which contains the locking device, is factory assembled into a rugged integral unit which cannot be readily injured or have component parts lost by casual tampering.

To connect the coupling, you merely push the plug into the socket with one hand. Flow is instantaneous. To disconnect, push back sleeve on socket—coupling disconnects. Flow is shut off instantly and automatically.

Write for catalog giving complete range of types and sizes.

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TRADE LITERATURE

For Free Booklets and Catalogs—Convenient Request Card on Page 2

Magnetic Chuck

Illustrated pamphlet discusses magnetic lathe chucks, their uses, advantages and operating principles. Magnetic Holding Devices, 2034 E. 22nd St., Cleveland 15, Ohio. **L-4-1**

Steel

Booklet introduces details about special hot dipped, zinc coated strip steel Galvanite, including information on its working, uses and advantages. Sharon Steel Corp., Sharon, Pa. **L-4-2**

NEW!

"Auto-tap" TRADE MARK

LEAD SCREW TAPPING HEAD for Your Drill Press

New Features

★ Quick-change lead screw
★ New type 'V' clutch
★ Positive depth control
★ Positive-drive tap

Model 205 for #0 to 5/16" taps
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The new Auto-Tap Head guarantees precision tapping, more production, and less spoilage with unskilled help.

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Maintenance

Informative folder deals with putting maintenance control on an orderly basis with copy forms, discussing such points as maintenance ordering, scheduling and job assignment, scheduling preventive maintenance. McCaskey Register Div., Victor Adding Machine Co., 101 W. 31st St., New York 1, N. Y. **L-4-3**

Drill Jigs

Widely illustrated, indexed catalog offers line of drill jigs, pointing out special features, design and uses; includes dimensional tables and drawings. Swartz Tool Products, Div. of Jefferson Box & Mfg. Co., 13330 Foley Ave., Detroit 27, Mich. **L-4-4**

Hoists

Details on performance, safety features, construction and specifications included in 6-page bulletin on Quik-Lift electric hoists. Includes descriptions of various accessories. Coffing Hoist Co., Danville, Ill. **L-4-5**

Heat Treating

Series of "Heat Treating Lessons for Laymen" pamphlets containing brief practical information on how to get best results from heat treaters offered as a helpful short course on the subject. Request on company letterhead directly to Perfection Tool & Metal Heat Treating Co., 1740-58 W. Hubbard St., Chicago 22, Ill.

Bronze Bearings

Indexed, 25-page catalog of "Standard Oilite Bearings" lists more than 700 bearings, cores, bars and plates carried in stock by Oilite outlets. Includes dimensions data, capacity charts and ordering information. Amplex Div., Chrysler Corp., P. O. Box 2718, Detroit 31, Mich. **L-4-6**

Surface Finish Control

Informative brochure concerned with surface finish control and how it can reduce machining costs, increase production capacity and improve products. Cites specific examples to illustrate various points, and includes charts and diagrams to support data. Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio. **L-4-7**

Air Cylinders

Catalog 109 covers line of heavy duty air cylinders for automation as well as general applications. Outlines important features and details on installation, and includes dimensional drawings and ordering information for various models. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio. **L-4-8**

Meehanite Castings

Bulletin No. 43, "Meehanite Castings for Pressure Tightness", discusses specific applications, particularly where specifications demand absolute density, uniformity and resistance to various pressure ranges; provides engineering property charts and pressure casting design suggestions. Extensively illustrated with photos, drawings and charts. Meehanite Metal Corp., 714 North Ave., New Rochelle, N. Y. **L-4-9**

Bench Milling

Illustrated pamphlet deals with company's precision horizontal bench milling machine, outlining important features and advantages and listing specifications. Elgin Tool Works, Inc., 1770 Berteau Ave., at Ravenswood, Chicago 13, Ill. **L-4-10**

Nickeloid Metals

Fabrication techniques, uses and properties of prefinished Nickeloid metals described and illustrated in 24-page booklet; discusses production techniques with these metals, and also offers concise table of properties and sizes. Request only on company letterhead direct to American Nickeloid Co., Peru, Ill.

Stretch Forming

"Design Engineers' Bulletin," first of a series of informative pamphlets, deals with stretch forming methods approached from case history angle; illustrated by photos and drawings. The Cyril Bath Co., 32382 Aurora Rd., Solon, Ohio. **L-4-11**

Taps

New edition of the Besly Tap Reference Booklet contains up-to-date information on British-American Unified Thread Standards, giving a practical easy-to-understand explanation of the standards; includes tabulated comparison between Unified Thread forms and American Standard Threads. Also has data on tap-drill sizes, selection of taps for various work and material, feeding speeds, how to sharpen, coolants and terms and definitions. Request on company letterhead directly to Besly-Welles Corp., Beloit, Wis.

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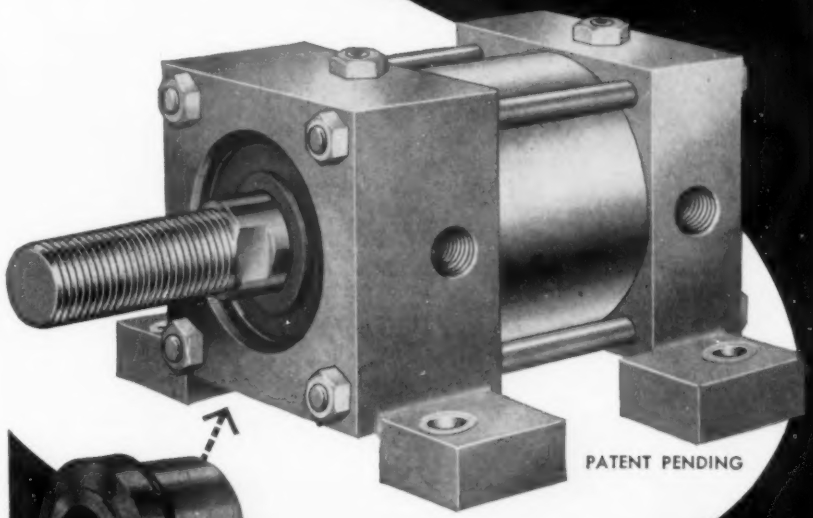
HEAVY-DUTY
AIR CYLINDERS
for
Automation



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PACKING CARTRIDGE
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Step up production with rugged, service-free, S-P Heavy-Duty Air Cylinders:

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- Extra long cushions
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* S-P Automation Cylinders were designed expressly for a large automobile manufacturer. They are thoroughly proven for automation and general heavy-duty applications. Prompt deliveries. Send for Catalog 109. For S-P standard Air Cylinders, request Catalog 102. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

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COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES AND ACCESSORIES

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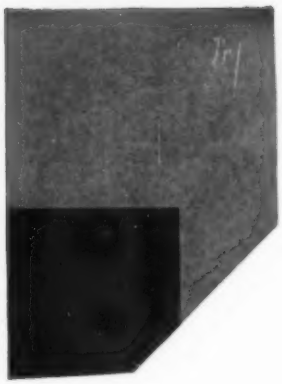

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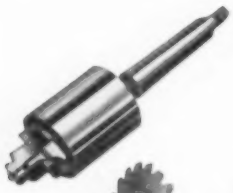

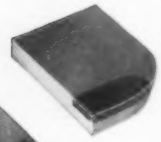

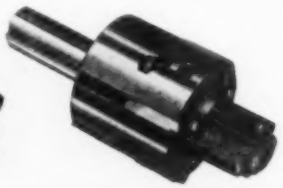

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Hydraulic Cylinders

Complete descriptions of series "J" hydraulic cylinders presented in 8-page Bulletin 53, emphasizing main performance features; drawings show body details, various mountings and their dimensions; includes engineering data. Hydro-Line Mfg. Co., 5768 Pike Rd., Rockford, Ill. L-4-12

Hydraulic Power

Company's hydraulic power units for push-button control of Kling friction saws is described in bulletin outlining important features, advantages and uses. Kling Bros. Engineering Works, 1320 N. Kostner Ave., Chicago 51, Ill. **L-4-13**

Moisture Control

Informative 4-page brochure, "Moisture Control in Compressed Air," discusses types and quantities of impurities and methods for their removal. Covers construction, operation and advantages and specifications of company's units for this work. Van Products Co., 3777 W. 12th St., Lakewood, Erie 2, Pa. **L-4-14**

Wire Straightening

Bulletin 58 presents detail about line of constant speed automatic wire straightening and cutting machines for work from 0.025 to ½ in. diameter. Illustrated. Mettler Machine Tool, Inc., New Haven 11, Conn. **L-4-15**

Alloy Chain

Bulletin No. 2 provides engineering data on three types of cast alloy chain of interest to industrial furnace designers and engineers concerned with high temperature conveyor applications; includes dimensional specifications on company's five classes of cast alloy rivetless chain. Standard Alloy Co., Inc., 1679 Collamer Rd., Cleveland 10, Ohio. **L-4-16**

Broaches

Descriptive folder No. 15 presents details about Glenny adjustable push broaches for precision keyways stressing simplicity of operation, economy and practical uses. Includes specifications and dimensional data. Kase Machine Co., 18430 Nottingham Rd., Cleveland 19, Ohio. **L-4-17**

Brake Dies

Literature and chart of 26 standard styles offered as guide in selection of proper types of brake dies for bending and forming sheets of steel and other metals. Service Machine Co., Inc., 560 Miller St., Elizabeth, N. J. **L-4-18**

O.E. Presses

Informative 20-page Bulletin 57A presents series of AA open back inclinable presses, describing operation, special features and advantages; includes specification tables and die space dimensions. Niagara Machine Tool Works, 683 Northland Ave., Buffalo 11, N. Y. **L-4-19**

Air Conditioning

Bulletin 1307 describes pulpit air conditioner for uses in industrial control areas where heat, dirt or fumes create hazards; lists mechanical features of unit, giving capacities, dimensions and other data. Dravo Corp., 1203 Dravo Bldg., Pittsburgh 22, Pa. **L-4-20**

Cylinders

Bulletin 100 covers line of Air cylinders, while Bulletin 1500 and 750 present lines of hydraulic cylinders 1500 psi and 750 psi series respectively. Each brochure is illustrated, describing and picturing special features, outlining important elements and advantages and tabulating dimensions and specifications. Carter Controls, Inc., 2800 Bernice Rd., Lansing, Ill. **L-4-21**

Drills

Wide variety of types of twist drills covered in illustrated brochure provides information on special XL drills; offers data on drill pointing and web thinning. The DoAll Co., Des Plaines, Ill. **L-4-22**

Carbide Dies

Latest data on standard cemented carbide die specifications and prices included in bulletin D-134. Carboloy Dept., General Electric Co., Detroit 32, Mich. **L-4-23**

Cam Followers

Six-page illustrated folder No. 217 gives detailed description on high capacity stud cam followers, giving load and life ratings; includes specifications and dimensional drawings for both these HCS cam followers and the regular type. Smith Bearing Co., P.O. Box 1119, Trenton, N. J. **L-4-24**

Grinders

Extensively illustrated with photographs and sketches, catalog F-53 presents details on company's 18 and 24 in. plain and roll grinders; describes design and construction features, main advantages, and specifications. Also covers standard and extra equipment. Landis Tool Co., Waynesboro, Pa. **L-4-25**

WHAT IS YOUR TOUGHEST CLEANING JOB IN AIRCRAFT PRODUCTION?

Does any job in the following list give you trouble? If you'll circle the corresponding number in the coupon, we'll be glad to tell how we can help you.

This list of cleaning (and related) jobs was made up with the advice of several of our customers in aircraft production. It shows, in order of volume, the jobs on which Oakite has most frequently been able to save them time and money. Here it is:

1 Cleaning aluminum, steel and magnesium
2 Stripping paint (solvent or hot tank)
3 Machining, grinding, forming
4 Deoxidizing aluminum
5 Steam cleaning aluminum and steel
6 Deflocculating paint in spray booths
7 Preparing metal for painting
8 Removing scale and corrosion
9 Preventing corrosion

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FREE Our 48-page illustrated booklet "*How to Clean Metals in Aircraft Production*" contains information on all the cleaning jobs in the list.

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Send me a FREE copy of your booklet "*How to Clean Metals in Aircraft Production.*"

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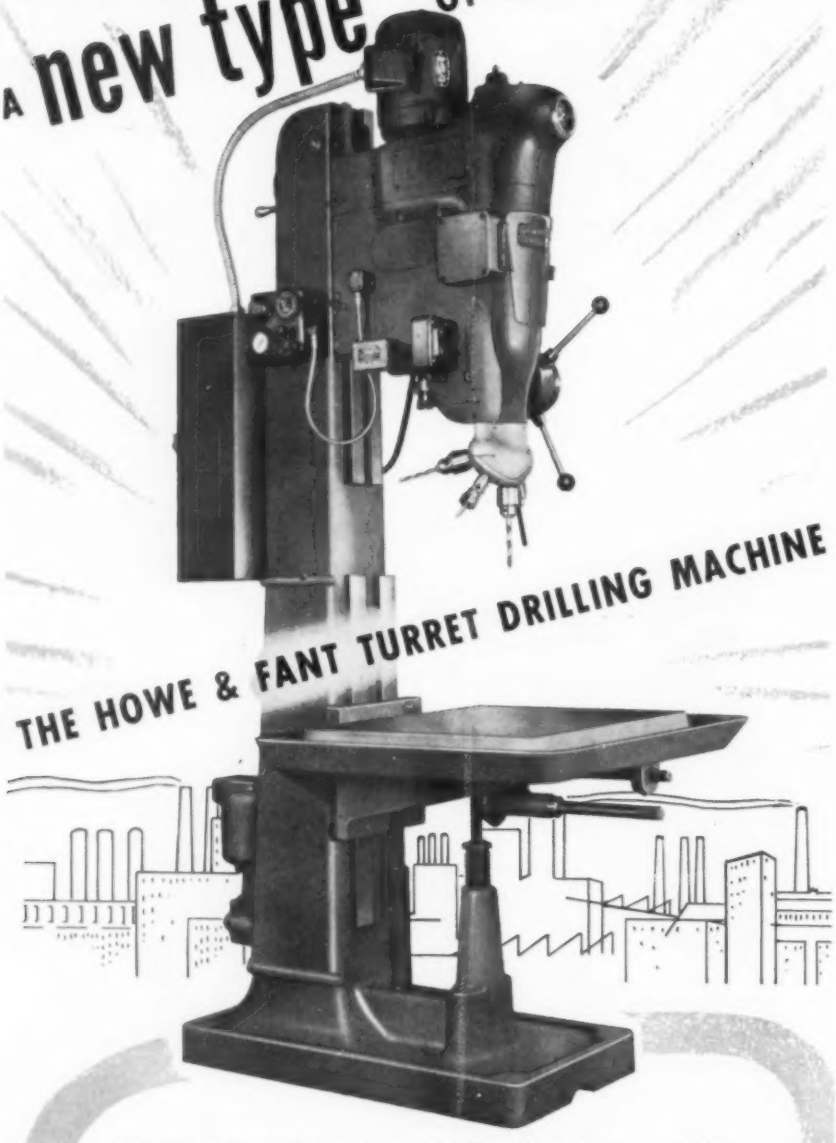
A **new type** OF MACHINE TOOL



THE HOWE & FANT TURRET DRILLING MACHINE

The HOWE & FANT Turret Drilling Machine is a revolutionary development that does for drilling what the modern turret lathe does for turning.

FASTER. One operator performs up to six different drilling and tapping operations, in any sequence, at a single station. No time is lost moving work from one station to another. Speeds, depths, and reversals for tapping are all pre-set, and require no attention during successive operating cycles.

MORE VERSATILE. Speed of each spindle is independently determined, and is infinitely variable from 200 to 4000 rpm. Depth stops are individually set for each spindle, and are accurate to less than 0.002 inch. For tapping, automatic reverse at twice forward speed is available at each spindle.

LOWER COST. All this is yours in a half-inch capacity machine that takes only 34 by 50 inches of floor space . . . at a basic cost of $2950.

HOWE & FANT, INC.

32 Fitch Street, East Norwalk, Conn.

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Or Write for Bulletin 5403

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Hose Assemblies

Indexed, illustrated brochure, No. G52, covers line of hydraulic automotive and industrial hose assemblies and fittings, giving suggestions for installations, dimension and specification data. Flex-O-Tube Div. of Meridan Corp., Lafayette at 14th, Detroit 16, Mich. **L-4-26**

Vibration

Informative folder, Bulletin 537, discusses vibration isolators, outlining their purpose, important performance characteristics and applications. Includes graphs showing isolator efficiency. The Barry Corp., 700 Pleasant St., Watertown 72, Mass. **L-4-27**

Steel Castings

Slide Chart gives facts on steel casting material selection; includes reference data on 19 carbon and low alloy grades and 17 stainless and corrosion-resistant grades; covers analyses, mechanical properties and heat treatment of the grade. Lebanon Steel Foundry, 161 Lehman St., Lebanon, Pa. **L-4-28**

Cylindrical Grinders

Twenty-page booklet deals with job engineered cylindrical grinders; discusses economics of resultant low cost production. Photos and drawings illustrate operations and applications of various types grinders. Landis Tool Co., Waynesboro, Pa. **L-4-29**

Dust Collector

Bulletin 916 explains operation, applications, features and advantages of company's CN cloth bag dust collector. Pangborn Corp., Hagerstown, Md. **L-4-30**

Valves

Booklet on "Getting the Most Out of Your Valves" covers selection of valve types and materials, installation and operation hints; also offers inspection and maintenance pointers. The Cooper Alloy Foundry Co., Hillside, N. J. **L-4-31**

Switches

Data Sheets, 64a, 66, 68a, 71, P74 and P75 cover various switches including low-force with lever actuators; high-precision, roller plunger; Micro double-pole, double-throw; subminiature; magnetic blow-out; and one-way actuation types. Give design information with drawings, ratings, specifications and characteristics. Micro Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill. **L-4-32**

Heat Treating

Four-page folder "Heat Treaters Cite Short Cuts to More Effective Purchasing" offers information designed to help purchasers without comprehensive metallurgical knowledge by offering information required to specify heat treating properly; covers information about what should be specified on orders for such services; also includes complete glossary of terms used in this field. Metal Treating Institute, 271 N. Ave., New Rochelle, N.Y. **L-4-33**

Steels

Designation chart, Bulletin 253-LA, for carbon and low alloy steels, offers identification for company's Isocast castings with ASTM, Federal, Navy, AISI and SAE specifications; gives chemical analysis, mechanical properties, heat treatment and uses of 18 steels listed. Empire Steel Castings, Inc., Reading, Pa. **L-4-34**

Presses

Design details and specifications on complete line of knuckle presses for squeezing operations covered in indexed catalog. Well illustrated. Verson All-steel Press Co., 9336 S. Kenwood Ave., Chicago 19, Ill. **L-4-35**

Screw Machine Facility

"Procedures for Precision" offers detailed account of screw machine company's facilities, products, quality control precautions and samples of work. Extensively illustrated. Conklin Swiss Screw Machine Co., Div. of Conklin Pen Co., Inc., 900 N. Franklin St., Chicago 10, Ill. **L-4-36**

Speed Reducers

Illustrated 84-page catalog 42-B presents detailed data on line of right angle gear speed reducers; covers parallel and vertical drives with ratios from 1:1 to 1100:1 and rating from .14 to 350 hp; includes specifications and recommended practice for selection. D. O. James Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill. **L-4-37**

Molding Machines

Twenty-four page catalog "Let's Look at the Herman Line of Molding Machines" covers company's line of machines, including Herman 750 and 1500 lb jolt rollover vertical hydro-centrifugal casting machines; indexing machines. Outlines important details, advantages and installations; well illustrated. The Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh, Pa. **L-4-38**

Belt Finishing

Twelve-page brochure, "The 3 M Method of Belt Grinding and Finishing," describes this method, emphasizes advantages offered, and illustrates with photos and drawings eight abrasive belt machines for a wide range of typical grinding applications; includes case history to illustrate various points. Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn. **L-4-39**

Aluminum

Folder presents information on aluminum cast plate and bar for tools, dies and fixtures, pointing out numerous advantages resulting from its use; illustrated. Reynolds Metals Co., Louisville 1, Ky. **L-4-40**

Heat Treat Furnaces

Folder covers electric heat treat furnaces, describing heating elements and their methods of mounting. Classifies units according to methods of handling stock. Holcroft and Co., 6545 Epworth, Detroit 10, Mich. **L-4-41**

Pyrometer Supplies

Forty-eight-page revised Buyers Guide, 100-5, illustrates and describes line of pyrometer supplies including many special purpose items as well as general thermodouple assemblies and components; covers selection, care and application information. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa. **L-4-42**

A "NEW" PROCESS
CARBIDE DIE
PLUS...
"Actual engraved letters or numbers in CARBIDE for use in stamping HARDENED steels"
TUNGSTEN CARBIDE BODY DIE
These dies may be made to any size or shape for use as inserts in stamping and forming dies—or as separate letter or number stamps.
TUNGSTEN CARBIDE TIPPED CIRCULAR FORM TOOL
SOLID TUNGSTEN CARBIDE END MILL
CARBIDE TIPPED FORM CUTTER
CARBIDE POWDER MOLD
TUNGSTEN CARBIDE TIPPED FLAT FORM TOOL
DIE SECTIONS SOLID CARBIDE
TUNGSTEN CARBIDE HEADING PUNCH
Send a drawing, rough sketch or sample of what you would like in carbide for our quotation. Our trained carbide specialists will provide the special tools or adaptations you need at a reasonable price.
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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-247

Men at Work . . .

Thomas H. Pattison has been made superintendent of operations at the Garrison plant of Mackintosh-Hemphill Co. Mr. Pattison, who has been associated with the company since 1920, has been its plant metallurgist since 1937.

At the recent election of officers by the board of directors of Behr-Manning Corp., subsidiary of Norton Co., **Elmer C. Schacht** was reelected president for his fifth term. At the same time, two new vice-presidents were named: **Leon E. Hoogstoel**, the firm's technical director since 1945, and **Edwin C. Evans**, the director of manufacturing.

Donald G. Clark has been elected a director of Firth Sterling Inc. Mr. Clark who for the past few years has served in a consulting capacity, was vice-president and a director of the company from 1928 to 1945 when he retired from active management.

Robert L. Henry has been placed in charge of manufacturing at the electronics division of The American Car and Foundry Co. Mr. Henry, formerly chief of the Bureau of Standards' electronic division, conceived, developed and directed "Project Tinkertoy." For his work on Project Tinkertoy, Mr. Henry was the recipient of the 1953 Arthur S. Fleming award, presented each year by the Junior Chamber of Commerce to young men in government for outstanding technical and scientific ability. Readers will remember him and his project from the article on the subject in the December, 1953, issue of THE TOOL ENGINEER.

Three directors have been added to the board of Worcester Pressed Steel Co. They are **Benno M. Bechhold**, president of the Savoy Plaza Hotel in New York; **Robert A. Weaver, Jr.**, president of the Bettinger Corp. of Waltham, Mass.; and **William E. Hill**, who is president of William E. Hill Co., a New York management consulting firm.

Charles D. Michaelson has been made a vice-president of Braden Copper Co., a subsidiary of Kennecott Copper Corp. In this position, Mr. Michaelson will be the chief executive of the company in Chile with offices in Santiago.

Vitro Corp. of America recently announced appointment of two men to managerial positions for two of its divisions. **Franklin H. Bivins** was named general manager of the newly created Vitro Rare Metals Co., while **G. Russell Tatum** was made general manager of Vitro Laboratories. Mr. Bivins was formerly assistant vice-president of Bristol-Myers Co. Mr. Tatum has been director of the Silver Spring Laboratory since joining Vitro in 1948.

A new department, known as Special Products, to handle special nonstandard gears, has been set up at the Boston Gear Works, and will be headed by **William D. Bell.** Mr. Bell has 33 years of experience in this field with the company.

The Scott & Fetzer Co. has named **Richard M. Simpson** to the job of superintendent of its factory. For 29 years, Mr. Simpson has been in charge of the company's toolroom, a post now filled by **Joseph Kuchta**, an employee of the firm since 1927.

13 Key Moore Tools help put the PRECISION in Harig Dies

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3 MOORE JIG BORERS, for accurate locating and boring of holes in a fraction of the time required by other means;

6 MOORE JIG GRINDERS, for relocating and grinding of holes and contours—within tenths—after hardening;

3 MOORE PANTO-CRUSH WHEEL DRESSERS, for speedy, cost-cutting performance of both crush-forming and diamond-dressing on the wheel spindle of a surface grinder;

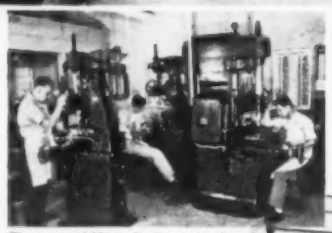
1 MOORE DIE FLIPPER, for "mechanized" die tryouts and assembly.

The combination of Harig craftsmanship and Moore precision tools has been an important factor in Harig's successful effort to meet continuing demands for faster production of intricate dies, tools, jigs, fixtures and gauges.

Why not discover how Moore tools can bring more speed and greater accuracy to your toolroom. Write today for our detailed literature.

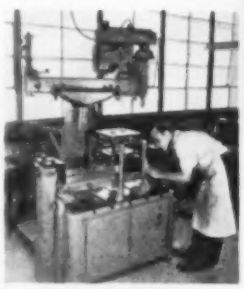
Moore Special Tool Company, Inc.
732 Union Avenue, Bridgeport 7, Connecticut

A battery of six Moore Jig Grinders performs precision internal and contour grinding operations on sectional die parts at the Harig plant.



Three rugged Moore Jig Borers handle the bulk of Harig's critical spotting, drilling, boring and reaming operations.

Harig uses this Moore Panto-Crush Wheel Dresser on a surface grinder for fast pantograph profile grinding. Harig also has two more of these cost-cutting units.



A Moore Die Flipper facilitates accurate die tryouts and assembly at Harig, replaces time-consuming hand-labor methods.

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W. B. **Duncan, who has served as president of Wesson Co. since 1941, now has been appointed chairman of the board of directors of the firm. He contributed an important part in development of Wesson's products.**

Ray C. Reinhartsen, former vice-president and sales manager of Onsrud Machine Works, Inc. is now executive vice-president and general manager. He will be responsible for plant production and production engineering.

William Adam, Jr. was elected president of Ajax Electric Co. He succeeds G. H. Clamer who continues as president of Ajax Electro Metallurgical, Ajax Electrothermic and Ajax Engineering corporations.

At the same time of the announcement of Mr. Duncan's appointment as chairman of the board, announcement was made of the succession of **E. Mortensen** to the office of president of the company. Prior to this time, Mr. Mortensen served the firm as vice-president in charge of manufacturing.

Formerly assistant chief engineer for the Allison Div. of General Motors, **Hershel V. Hiatt** has now been made director of engineering for the Milwaukee Div. of Le Roi Co., a subsidiary of Westinghouse Air Brake Co. In this position, Mr. Hiatt will be responsible for the organization of the engineering department at Le Roi and the direction of its efforts. He also will be chairman of the product development committee and responsible for the engineering department's recruitment and educational policies.

Alfred J. Porter, manager of the Bridgeport, Conn., plant of Heppenstall Co., has been elected a vice-president of that Pittsburgh company. Mr. Porter, who first joined Heppenstall as a part time worker in 1914, served successively as night superintendent of the forge shop, superintendent of heat treating, production manager, salesman, sales manager and manager.

Appointment of **Thomas H. Jeffers** to the post of assistant general manager of its Anaheim Div. in California, and of his election as an assistant vice-president of the company, has been made public by the Robertshaw-Fulton Controls Co. Mr. Jeffers has been chief engineer at Anaheim. According to the announcement T. T. Arden continues as general manager of the division.

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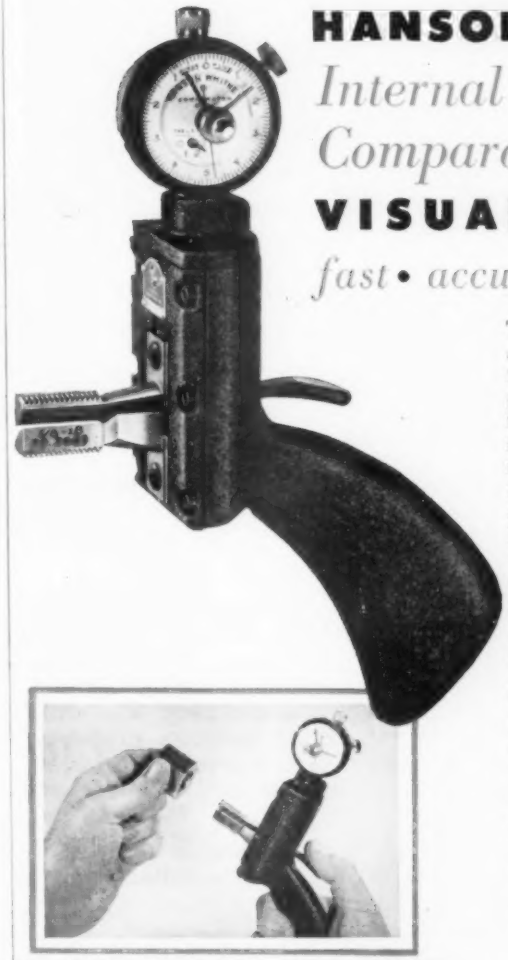

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Election of **Leland B. Flint** as director of Kennecott Copper Corp. has been made public. Mr. Flint is president of Flint Distributing Co. in Salt Lake City.

According to a recent release from the company, **John G. Fleming** has been named to the newly created position of product planning manager for The Bristol Co. This arrangement is intended to provide a more concentrated and direct approach to the company's short term and long range planning of new and improved instrumentation.

William Descault is the new works manager at Morse Twist Drill & Machine Co., assuming charge of manufacturing operations. Mr. Descault's background includes administrative staff positions with American Bosch, Trumbull Electric Co. and Gray Manufacturing Co.

Word from McReynolds Die & Tool Co. made public the election of **Elsie L. McReynolds** as president to succeed her late husband Charles S. McReynolds who founded the company in 1932. Mrs. McReynolds formerly was secretary-treasurer. She is succeeded by **George A. Dakoske** who also was elected a director.

New works manager of the Janesville and Menomonie, Wis. plants of the Parker Pen Co. has been appointed with the naming of **Phelps Walker**, formerly of the Fram Corp. In this position, Mr. Walker will be responsible for production, quality, scheduling, planning and engineering.

Three appointments have been made at Lebanon Steel Foundry. **Harold C. Templeton,** who formerly served as assistant metallurgist, was promoted to the position of chief metallurgist. **Ray W. Patridge,** who joined the Lebanon Steel in 1951, assumes the post of service manager. **Roy W. Daub,** who has devoted 11 of his 19 years of service with Lebanon to the planning department, now is chief planning engineer.

Henry Magnuski, engineer and inventor, has been made associate director of research in the Communications & Electronics Div. of Motorola. Before his promotion, Mr. Magnuski had been chief engineer of the division's research department. In his new capacity, he will act as technical consultant on all products manufactured by the division. Among his achievements was the development of the wartime Walkie-Talkie.

Who's Meeting - and Where

Apr. 5-6. Society of the Plastics Industry (Canada), Inc. Twelfth annual conference, Mount Royal Hotel, Montreal, Quebec, Canada. Society headquarters, 67 W. 44th St., New York 36, N. Y., can give details.

Apr. 5-7. American Institute of Mining & Metallurgical Engineers. Open hearth conference, and blast furnace, coke oven and raw material conference. Palmer House, Chicago. Contact institute office, 29 W. 39th St., New York 18, N. Y. for details.

Apr. 5-7. National Fluid Power Association. Spring meeting, Edgewater Gulf Hotel, Edgewater Park, Miss. For more facts, write association headquarters, 1618 Orrington Ave., Evanston, Ill.

Apr. 5-7. Metal Treating Institute. Spring meeting, The Homestead, Hot Springs, Va. Address institute office, 271 North Ave., New Rochelle, N. Y. for details.

Apr. 6-7. Westinghouse Electric Corp. Sponsor for Machine Tool Electrification Forum. Hotel Statler and Westinghouse works, Buffalo, N. Y. For details, write A. G. Muller, Westinghouse, East Pittsburgh plant.

Apr. 12-15. Society of Automotive Engineers. National Aeronautical meeting, Statler Hotel, New York City. Send for more information to society office, 29 W. 39th St., New York 18, N. Y.

Apr. 14-16. Society for Experimental Stress Analysis. Spring meeting and exhibit, Hotel Netherland-Plaza, Cincinnati, Ohio. Other details are available from society office, P. O. Box 168, Cambridge 39, Mass.

Apr. 19-20. Stanford Research Institute. Joint sponsors with the United States Air Force of Symposium on "Automatic Production of Electronic Equipment," Fairmont Hotel, San Francisco. Write to general chairman, L. K. Lee, head of Advanced Techniques

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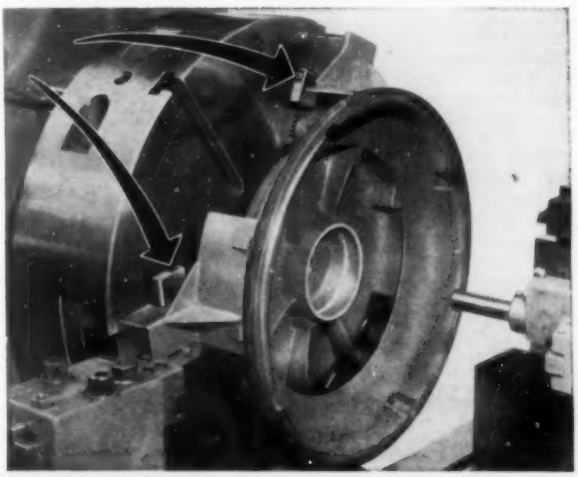

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Group, Engineering Div., Stanford Research Institute, Stanford, Calif. for complete information.

Apr. 20-21. AMERICAN ZINC INSTITUTE, INC. Annual meeting, Hotel Statler, St. Louis, Mo. More information may be obtained from the institute office, 60 E. 42nd St., New York 17, N.Y.

Apr. 21-23. AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Conference on feedback control, Claridge Hotel, Atlantic City, N. J. Institute office, 33 W. 39th St., New York 18, N. Y. can supply data.

Apr. 21-24. NATIONAL SCREW MACHINE PRODUCTS ASSOCIATION. Annual meeting, Hotel Statler, Detroit. Write association office, 2860 E. 130th St., Cleveland 20, Ohio, for complete facts.

Apr. 23-24. MACHINERY & ALLIED PRODUCTS INSTITUTE. Fifth session, seventh conference on capital goods economics. The Homestead, Hot Springs, Va. Write for details to institute office, 1200 18th St., N.W., Washington 6, D. C.

Apr. 26-28. METAL POWDER ASSOCIATION. Tenth annual meeting, Drake Hotel, Chicago. Get more information from association office, 420 Lexington Ave., New York 17, N. Y.

Apr. 26-30. AMERICAN SOCIETY OF TOOL ENGINEERS. Tool Engineers' Industrial Exposition, Convention Hall, Philadelphia, Pa., to be held concurrently with annual meeting, Benjamin Franklin and Bellevue Stratford Hotels.

Apr. 29-30. SOCIETY FOR THE ADVANCEMENT OF MANAGEMENT. Time study and methods conference, Statler Hotel, New York City. Complete facts available from society headquarters, 84 William St., New York, N. Y.

May 2-6. ELECTROCHEMICAL SOCIETY INC. Annual spring meeting, LaSalle Hotel, Chicago. Contact society headquarters, 216 W. 102nd St., New York 25, N. Y. for details.

May 3. CLEVELAND ENGINEERING SOCIETY, Invention Conference Group. Sponsor of Invention Exhibit and Conference. Contact the society, 2136 E. 19th St., Cleveland 15, Ohio, for full particulars.

May 3-5. ASSOCIATION OF IRON & STEEL ENGINEERS. Spring conference, Bellevue-Stratford Hotel, Philadelphia. More data may be had from association office, 1010 Empire Bldg., Pittsburgh 22, Pa.

May 3-14. BRITISH INDUSTRIES FAIR. Annual industrial show, London and Birmingham, England. Complete in-

nation may be had from any British consulate office in the United States, or from the British Information Office, 30 Rockefeller Plaza, New York, N. Y.

May 4-7. AMERICAN WELDING SOCIETY. National spring technical meeting, Hotel Statler, Buffalo, N. Y. to be held concurrently with second Welding & Allied Industrial Exposition, May 5-7, Memorial Auditorium. Contact society office, 33 W. 39th St., New York, N. Y. for more information.

May 8-14. AMERICAN FOUNDRYMEN'S SOCIETY. Annual convention and biennial exposition, Public Auditorium, Cleveland. Write society office for data: 616 S. Michigan Ave., Chicago 5, Ill.

May 12-14. PORCELAIN ENAMEL INSTITUTE INC. Midyear divisional meeting, Edgewater Beach Hotel, Chicago. For facts, contact institute offices in the DuPont Circle Bldg., Washington, D.C.

May 16-19. AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. National meeting, Kimball Hotel, Springfield, Mass. Institute headquarters, 33 W. 39th St., New York, N. Y., can give further facts.

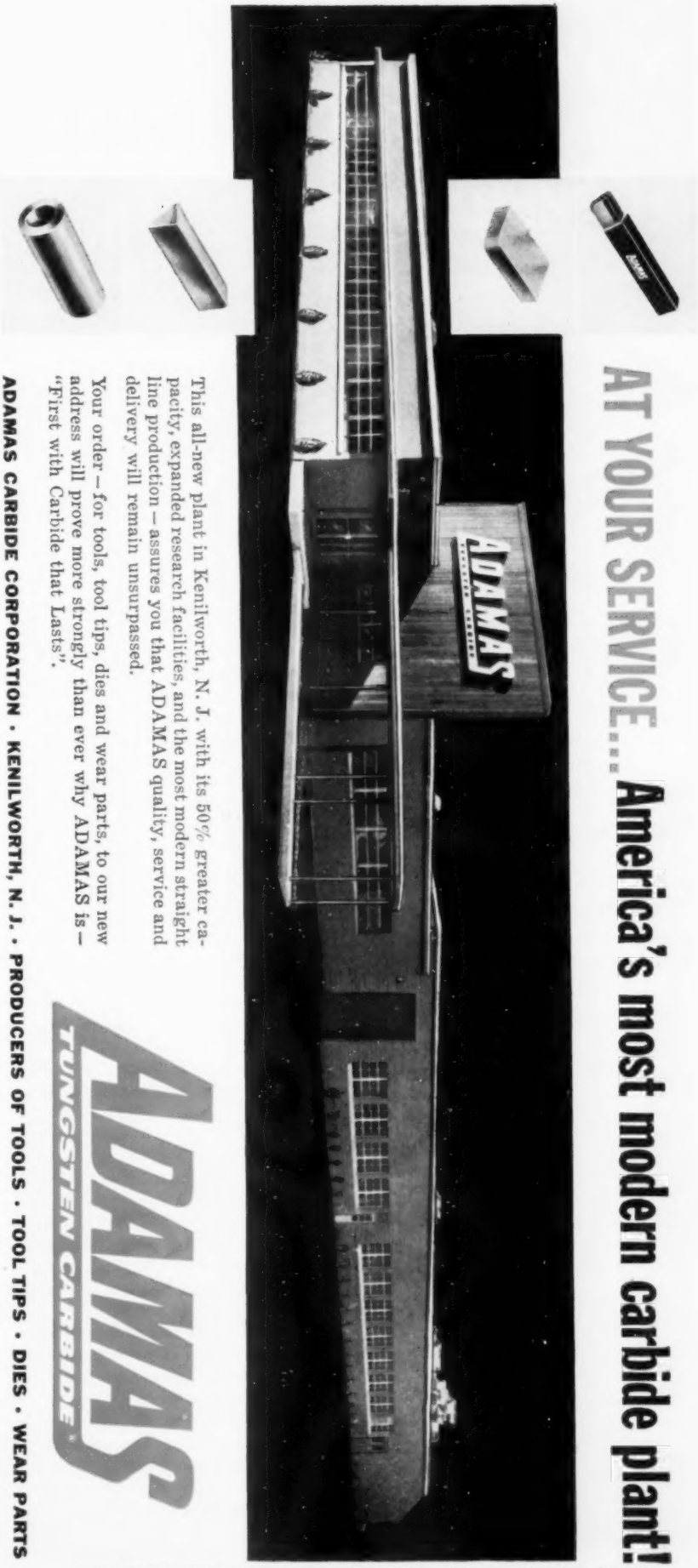
May 17-19. AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Appliance Technical Conference, Morrison Hotel, Chicago, Ill. Get more details from the Institute office, 33 W. 39th St., New York 18, N. Y.

May 17-20. BASIC MATERIALS EXPOSITION. International Amphitheatre, Chicago. Producers of the event, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y., can supply details.

June 9-11. AMERICAN SOCIETY FOR QUALITY CONTROL. Eighth annual national convention. Kiel Auditorium, St. Louis. Address inquiries to society office, 70 E. 45th St., New York 17, N. Y.

June 15-25. MASSACHUSETTS INSTITUTE OF TECHNOLOGY. Special two week summer program on "Machine Tool Technology" for users and builders of machine tools; will cover fundamentals of design, use and evaluation of machine tools as well as elements of fine measurement, statistics and quality control principles. For details contact Prof. Prescott A. Smith, Dept. of Mechanical Engineering, MIT, Cambridge 39, Mass.

Sept. 14-23. FOURTH EUROPEAN MACHINE TOOL EXHIBITION, Milan, Italy. For all details concerning the show, write to Mr. E. Vandone, Manager, Unione Contruttori Italiani Machine Utensili, Via Gaetano Giardino, 4, Milan, Italy.



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INDICATE A-4-254-1

Readers' Viewpoints

. . . investment casting

To the Editor:

We were extremely gratified to read the excellent and comprehensive article on Investment Casting by Mr. Edward Engel in the February, 1954 issue of THE TOOL ENGINEER. Mr. Engel has done a good job of outlining the advantages of investment casting as a production process that can be used to cast intricate shapes in high strength, high temperature metals, to close tolerances and surface finishes, thus permitting the production of finished parts requiring a minimum of machining.

Because this precision casting process is relatively new in the industrial field, many designers and tool engineers are not completely aware of its possibilities and limitations. For this reason we are grateful to Mr. Engel for his intelligent discussion of the advantages of this process.

Since we know that readers of THE TOOL ENGINEER are interested in the investment casting process we would like very much to take this opportunity to make some additional comments.

For example, Mr. Engel has indicated the superiority of investment casting to forging for small parts and we might add that castings have better control of dimensions than forgings, and in the case of short runs are more economical because expensive forging dies are not required.

Also, the article indicates that dimensional tolerances and surface smoothness are practically identical in the investment casting and shell molding process. I think, however, that most engineers will agree that investment casting gives considerably better surface and dimensional control. In shell casting the dimensional tolerances across the mold parting line are two or three times greater than investment casting where these lines do not exist.

The article indicates that maximum lengths and widths of parts producible by investment casting are presently approximately 5 x 8 inches. This is no longer true since recent increases in technical knowledge and experience have increased the size limitations. Several firms in this industry are presently making parts in large production which are approximately 15 in. or more, and parts up to 24 in. are regularly

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with the frozen mercury pattern investment casting process.

These comments are intended to be constructive because in all we feel that Mr. Engel has rendered a real and valuable service to production engineers and designers. We are happy to join with Mr. Engel in saying "In numerous cases parts produced by other means, as well as designs still on the board, could be converted into investment castings, resulting in lower manufacturing costs, improved design, appearance and function."

H. P. Dolan
Executive Secretary
Investment Casting Institute

. . . cooperation needed

To the Editor:

There is one point which I feel is worth raising in connection with your publication. We Britons have in the past often been accused of insularity of outlook, but it seems to me that American technicians may be tending that way. A perusal of your press generally tends to give the impression that most things good stem from U.S.A., which is the top and only industrial nation.

Now, I think that technicians should be global rather than national, and I think it would be striking a blow for world peace if your technical press would run articles from time to time showing that all the know-how is not concentrated with you, but that other nations, and, if you like, particularly the English speaking peoples, can run and are running their industries pretty well, within the limits imposed by their area, position, natural resources and population. By its policy of U. S. Aid your country affirms its desire to raise world living standards; it is but fair to your technicians to keep them alerted and informed of the real efforts being made in countries abroad to maintain these standards.

The popular press of a country can always be relied on to supply propaganda about ways of life in other lands, but the technician, as a citizen of more than average intelligence, has a right to know facts through the medium of his own technical press, and a technical paper should therefore regularly pinpoint and illumine methods and practices obtained abroad. Your people seem reluctant to spotlight industrial efficiency in any country other than your own. Britain may have done this ostrich trick to her detriment in the past; U.S. should note and avoid.

Ian J. Peacock
The Dale Ainstable
Carlisle, Cumberland
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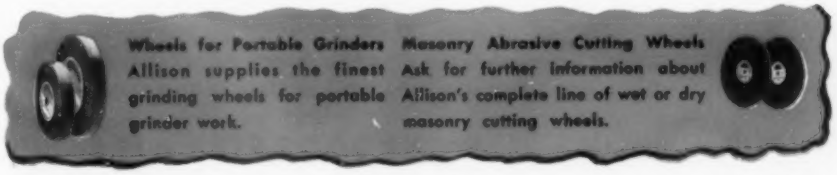
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good reading

METALLURGICAL DICTIONARY *by J. G. Henderson. Published by Reinhold Publishing Co., 330 W. 42nd St., New York, N. Y. Price $8.50. 396 pp.*

Arranged for the needs of all metal industries, this book contains over 5,000 definitions and discriptions used in production and physical metallurgy. Related terms are cross-referenced to supply synonyms for preferred terms and to facilitate reference.

Also contained in the book are company trade names and an appendix for general metallurgical discussions.

TEMPERATURE MEASUREMENT IN ENGINEERING, *Vol. 1, By H. Baker, E. A. Ryder, and N. H. Baker. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $3.75. 179 pp.*

First of two volumes, this book discusses temperature in terms of engineering measurement. Design, construction, operation, and effective temperature measurement installation are thoroughly treated.

Types of conditions encountered in producing temperature-measurement designs are classified, such as physical basis, interior points in solids, liquids, gases, and flames. The thermocouple technique is discussed often because of its wide usefulness in measuring internal temperatures of solid bodies.

PROTECTIVE ATMOSPHERES *by A. G. Hotchkiss and H. M. Webber. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price $7.00. 341pp.*

The intention of this book is to assist supervisory process and plant engineers and metallurgists in obtaining a usable understanding of the various phases of protective atmospheres. No attempt has been made to present a scientific treatise on theory or equipment design. Emphasis has been placed on practical aspects in the form of an operating manual.

Among the subjects discussed are: basic chemical reactions of gases used for furnace atmospheres, atmospheres for preventing or reducing oxides, instruments for analyzing, controlling and measuring gases and applications of protective atmospheres.

DESIGN OF MACHINE MEMBERS, *3rd Edition, by Alex. Vallance and Vernon L. Doughtie. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price $6.00. 500pp.*

This text on the design of machine elements—from riveted joints to flat plates and cylinder heads—includes basic theory and application. Numerous problems are given, especially constructed to develop the judgment of the reader and to show how to analyze service requirements and make logical compromises.

Some topics discussed are: engineering materials, metal fits and tolerances, threaded fasteners and power screws, shafts, couplings and clutches, sliding bearings, springs and miscellaneous machine members.

ENGINEERING FORMULAS AND TABLES *Published by Lefax, Ninth and Sansom Sts., Philadelphia 7, Pa. Price $4.25 six ring binder, two ring binder $2.25. 396 pp.*

This pocket size reference manual contains basic formulas, design data and tables for mechanical, electrical and civil engineering. Twelve printed, celluloid-tabbed indexes give access to the information desired. Sections include: mathematics, measures, materials, gages, mechanics, electricity and magnetism, hydraulics, structural data, reinforced concrete pipe and fittings, steam tables, and math tables.

INDUSTRIAL AND COMMERCIAL ELECTRICAL REFERENCE, *by E. S. Lincoln. Published by the Electrical Modernization Bureau, Inc., New York 17, N. Y. Price $18.75. 1,700 pp.*

This second edition is a complete source of current information about industrial electrical equipment. A few of the topics discussed in detail are as follows: electrified industry, electrical fundamentals, industrial wiring systems, switchboards and substations, panelboards, electrical control, protective equipment, motors and generators, electric welding, industrial electronic equipment, electrical measuring equipment, and electrical surveys.

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Technical Digests

Production of the Corvette Plastic Body

By E. J. Premo

Chevrolet Motor Div.
General Motors Corp.

THE CORVETTE BODY IS THE RESULT of intensive research on the functional application of reinforced plastics to the automotive field. The body shell, *Fig.* 1, weighs only 340 pounds. It is composed of glass fibers and polyester resins combined in a laminating process. The transparent plastic material has almost three times the thickness of steel and little more than half the weight of a comparable steel structure.

Until permanent tooling and production facilities could be prepared for the matched metal die method, it was decided, after a survey of various methods, to produce the first 300 production bodies by the vacuum bag process. While the body panels were designed to meet the requirements of the matched metal die process, the same design was used for experimental hand-lay and vacuum bag tooling so that a gradual change-over could be made as the production tooling was completed.

The general body panel break-up is shown in a view of the actual body parts, *Fig.* 2. The largest single piece is the underbody, which includes the entire floor, the toepan surface and the lower portion of the dash panel. The lowest part of the rear quarters and the rear panel are also included up to the widest point of the body, which provides a natural parting line. The shape of the underbody necessary to clear the chassis provides a great deal of the stiffness required. So few reinforcements are needed.

Wood models made to check the surface development were constructed so as to be suitable for use in making tools for production, *Fig.* 3. After individual wood models had been fitted together to check over-all surface development and the match of panels, they were altered to provide for various production tooling.

Experimental and Preliminary Parts Production

Hand lay tools for the first experimental and preliminary production bodies were constructed somewhat stronger than usual because of the number of parts it was planned to make on them. In making these tools, a run-out area was added around the edges of the wood model to allow extra stock for trimming. The model was coated with a parting agent and four layers of glass-fiber cloth saturated with epoxy resins were laid up.

After a four-hour cure at room temperature a coarse material was bonded with resin to the back of this laminate to provide a mechanical attachment for the two inches of reinforced plaster which was used as a base. A hand lay mold was then attached to a hardwood frame by supports which were bonded to the reinforced plaster. The completed unit is quite sturdy and durable.

In adapting the vacuum-bag method for making panels for the first 300 production bodies, many novel features were developed and satisfactory parts produced. In this process the mold is first coated with a parting agent and then three layers of fiberglass mat are laid on. Resin mixture is then spread and the mold covered with a thin plastic bag which is sealed at the edges. An upper frame is clamped in place, *Fig.* 4, and the air exhausted to a vacuum to give atmospheric pressure on the part. The part is then cured by heat lamps contained in the upper part of the mold. This requires approximately an hour, after which the part is removed and flash cut off, *Fig.* 5.

Matched Metal Die Process

Matched metal die tooling for volume production began with the wood model to which a flange runout was attached.

Fig. 1. Corvette assembly line. Cars start with frame on a six chassis. Axles, springs, wheels and engines are added before body drop. Form-fitting bucket seats are not installed until after the body has been attached to the chassis and wiring hookups completed.

Fig. 2. Major components of the reinforced plastic body: instrument panel, bulkhead and seat back, rear fender top panel, underbody and front end.

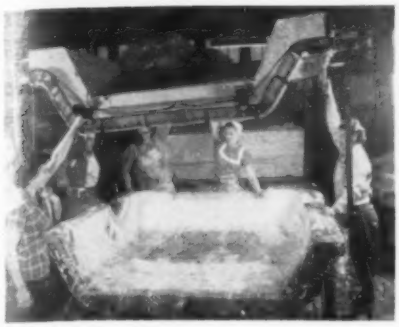


Fig. 3. (Top) Mahogany die model for underbody.

Fig. 4. (Bottom) Lowering upper frame of vacuum mold.

Four major units were made to facilitate machining the metal dies, namely, a Keller model for the female die, a spotting rack for the female die, Keller model for the male die and spotting rack for the male die. The female Keller model is made directly from the wood model, using epoxy resin and glass fiber cloth, similar to the hand lay process. A steel framework is constructed and lowered over the laminate while still tacky, the legs being tied in this glass cloth which is saturated with resin. The assembled unit is allowed to cure.

The male Keller model is made from the female with sheet wax the thickness of the part to be produced in between. Kellering of the dies, *Fig.* 6, follows the usual practice in making tools for pressed metal parts, the main difference being only one die is required.

Fig. 5. (Right) Removing flash from cured part. Any surface defects are sanded for later repair.

Fig. 6. (Below) Die ready for removal from Keller machine shows rough surface requiring barbering.

A 30,000-square-foot plant was constructed to make parts for the 10,000 Corvettes to be produced in '54; fifteen large presses from 250 to 500 tons were installed in the pit line ranging from 42 by 49 to 84 by 144 inches, the largest being for the underbody. Hydraulic pressure used is 2,000 psi. When complete, the plant will be equipped with preform machines, conveyor systems, ovens and a finishing department.

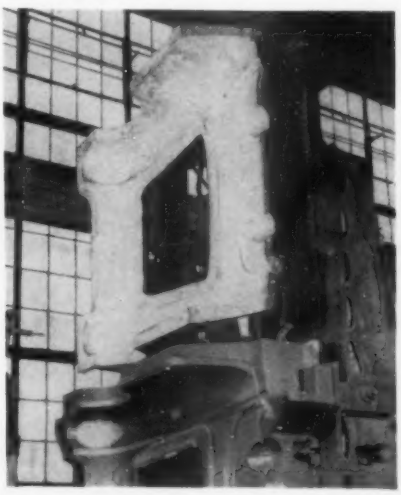
In production forming of parts, surface mat of fine filaments of fiberglass, is laid in the metal die. A fiberglass preform, held by a preliminary coat of resin, is added and a measured amount of resin mixture poured on. The die is closed for a period of approximately three minutes, after which it automatically opens and the part is removed. The edges are then filed or sanded to remove fiberglass not completely pinched off by the die.

Visual inspection is made for cracks, low spots and imperfections. Cracked parts are discarded, rough parts sanded and small pits filled with resin. Small repaired areas are cured by heat lamps. If satisfactory, the parts are rubber-stamped and shipped to the assembly plant. Operation of removing a parting agent is unnecessary with this process since a coating of wax applied to the die once or twice a day is all that is necessary to keep parts from adhering. Small parts are boxed for shipment; larger parts simply stacked on pallets.

Assembly

Reinforced plastic parts are received at the assembly plant in various stages of completion. They are stored on pallets and racks at strategic locations along the assembly line after drilling and trimming operations have been completed, *Fig.* 7.

Assembling begins with the underbody which is placed in a fixture near



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the beginning of the line and clamped. A drill jig with bushings for drilling holes is lowered by electric hoist, *Fig.* 8. This jig itself is of reinforced phenolic tubing with locating faces of fiberglass reinforced with epoxy resins.

The underbody is next transferred to a rotating type assembly fixture where body sills and floor reinforcements are bonded and riveted in place. Aluminum rivets are used to avoid necessity of clamping fixtures. In this way, assembly sequence proceeds without delay. Bonding material is a mixture of activated polyester resin and chopped glass fiber. Mating surfaces are disk-ground to assure good attachment.

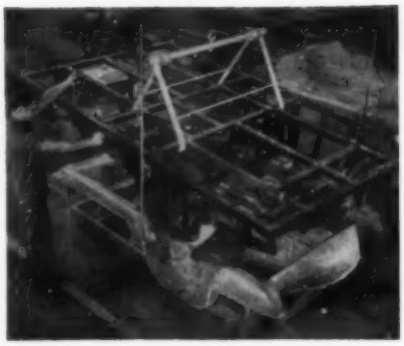

Fig. 7. One-piece instrument panel is bored for dial, gage and controls.

After this step, the assembled underbody is placed on a body truck which serves as a conveyor and assembling jig. Other parts of the body such as the rear upper panel, front upper panel, and other major assemblies are built up in feeder lines, then placed on the underbody for assembly. The flanges may be reworked as necessary to obtain a good fit before bonding. Little of this type of work is required on parts made by matched metal die process.

Anchor plates for windshield wiper transmissions are riveted to the cowl bar reinforcement, which is assembled to the upper panel. Riveting of steel anchor nuts and reinforcements to the plastic to provide hard spots of body hardware is general throughout the body. There is a conspicuous absence of any positioning fixtures on the final body line. Once manufacturing tools are tuned up, parts made are quite uniform. There is no springback of the parts and flanges match well. The completed front upper panel assembly in underbody are joined in the main assembly fixture. Rocker side panels are clamped in place later and bonded. Taillight and headlight housings, tailpipe ducts and seat separator panels are assembled then to the body. Side-door assemblies and hood, deck lid and top compartment cover assemblies are fitted to the body and removed for painting. Miscellaneous holes for assembling interior trim moldings, body hardware, etc., not previously provided in the subassemblies, are jig-drilled and the body is ready for finishing operations.

Fig. 8. Jig is lowered on underbody for drilling of rivet holes.

All surfaces are cleaned to remove any parting agents that might remain and surfaces requiring a high-luster paint finish are sanded, *Fig.* 9.

The body is steam-cleaned, wiped with denatured alcohol, remaining dust removed with a varnish tack rag and the body painted. Body glaze is used to

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any imperfections and the body baked, cooled and excess glaze sanded off. Painting, otherwise, is the same as for a steel body. Finished sur-

Fig. 9. Body after assembly being prepared for paint processing.

faces are water sanded as required and polished the same as for steel bodies. The body then moves down the trim assembly line where it is completed with side doors, top storage compartment cover, deck lid, etc., which have been previously fitted. After completion, it is dropped on the chassis, bolted in place and the hood installed and adjusted, Fig. 1. This completes the Corvette assembly and, after inspection, a check of performance is conducted and necessary adjustments made before delivery.

From a paper presented at the 1954 SAE annual meeting.

▼ ▼ ▼

The Atomic Age's Challenge to Industrial Design

By Arthur Van Dyck
Radio Corp. of America

Similarly with machines, as with the human body, exact studies of the behavior of materials is possible with radioisotopes. For example, if the steel in an engine bearing or piston ring is made with radioaactive carbon instead of ordinary carbon, its mechanical and chemical performance will be unaffected, but if any of the steel is worn away, it can be traced and measured. Thus, a few hours running of the engine can give information on the wearing quality of a new design, which formerly required weeks. Within the past year, oil companies have announced improvements in the lubrication quality of oil, made possible by this better means of testing.

Within a lifetime some or all of the following contributions can be expected from atomic science:

Generation of electric power from atomic fuel, certainly in areas where coal and water power are unavailable, such as arctic regions. Totally new applications for power may result.

Power for large, long-range transportation units, especially large ships and aircraft.

Power for small transportable units, as used in outboard motors, lawnmowers and the like. The problems now appear insurmountable, but have a way of being overcome by development.

The invention of new materials, and improvement in characteristics of old ones. All the processes and products of chemistry and metallurgy will be greatly improved.

Startling discoveries in medicine, biology, nutrition, food preparation, and the life processes.

Sterilization of food products after packaging, with consequent freedom from the necessity of refrigeration.

Discovery of causes of gravity, and how to control it. Gravity is some force between atoms, and nothing is known about it except that it is extremely small compared to the forces which hold the nuclei together. It seems likely that the nature of the forces inside and outside the atom will be discovered soon. Recently Einstein has announced a mathematical expression which he thinks represents their relationship in abstract terms. There may yet be magic flying carpets in reality.

Improvement in industrial processes, and the introduction of new ones. Examples of these which are already in use are the detection of leaks in pipe lines, detection of contamination, continuous measurement and automatic

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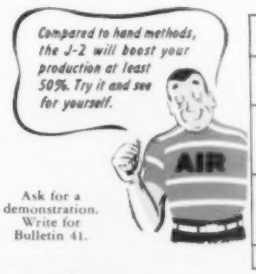

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control of thickness of sheet material during fabrication.

The chief effect of atomic science is a great increase in the effectiveness of all branches of science and engineering. Whether a design problem is chemical, metallurgical, electrical, or mechanical, its solution is now expedited by the new atomic knowledge.

It is in just this sort of an unstable situation that industrial design has its greatest opportunity. The industrial designer who follows his creed of encouraging the fusion of beauty, convenience, and efficiency of manufacture and use, will find plenty of opportunity for the exercise of his talents among the abundance of new possibilities resulting from the rapid surge of science.

In illustration of the indirect but real effect of the new science on industrial design, the case of color television can be cited. Color television will have considerable influence on packaging design, and will offer some attractive possibilities. The connection between color television and nuclear science may seem remote, but it is not. Without the knowledge provided by nuclear science within the past few years, there would be no color tubes and controls. So it will be in all the interlocking branches of science and design.

There will be an accelerated flow of new materials, improved characteristics of old materials, and new processes. These in turn will make possible new products and improvements in old ones. It will be difficult for the engineer to keep himself fully informed even in his specialty.

Some results of the new abilities of science which will have considerable social as well as industrial impact are already visible. One is the electronic calculating machine, which is now in its early stages of commercial application.

Another example is the automatic factory, which is being studied intensively in several industries, and will undoubtedly be in wide use before many years. A considerable degree of automatic operation is now practiced in a few industries, particularly the oil and chemical, but those which involve fabrication and assembly with high precision, have had to wait for precise means of measurement and control. These are now available, in electronic and atomic devices, and one can expect to see automatic operation introduced in many high production industries.

Product design for the automatic factory, and even the partially automatic one, will intensify the problems of the designer. The rapidity of production, the building in of colors, and other similar factors, will put premium on designs which not only have appeal, but which can be produced either farther in advance of use, or be changed over faster in production. Internal standardization and simplicity of design will become "musts" with "automation."

From a paper given at 1953 Annual Meeting of Society of Industrial Designers.

▼ ▼ ▼

Seizing and Galling in Metal Wear

By Harry Czyzewski
Tech. Director

Metallurgical Engineers, Inc.
Portland, Oregon

Alloys of the class called self-lubricated alloys, have a resistance to accelerated mechanical abrasion which it has been impossible to duplicate by external lubrication. Alloys in this class include gray cast iron (graphite lubricant), oil-impregnated power-metal compositions (oil lubricant) and leaded copper-base and iron-base alloys (lead lubricant). The mechanical aspect of seizing in metal wear accounts in a qualitative manner for the observed phenomena in accelerated mechanical abrasion. The mechanical analysis also explains the failure of externally lubricated alloys to equal the performance of self-lubricated alloys.

When a particle abrades a surface, there is a definite relationship between the dimensions of the abrading particle and the track, or furrow, left on the abraded surface. The mechanical abra-

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may be classified in two general categories; (a) normal, (b) accelerated. In normal mechanical abrasion, the track left by the abrader has a profile the same (except for elastic recovery) as the profile of the contacting part of the abrader. There is little difference in response to normal mechanical abrasion between self-lubricated and homogeneous (externally lubricated) alloys.

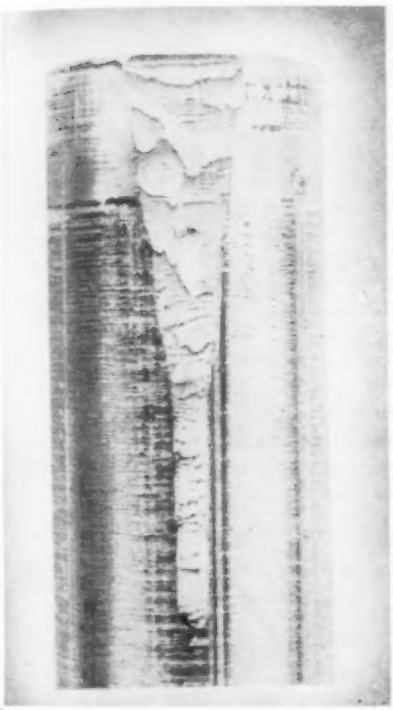

Fig. 1. Galling of steel shaft. Tract width decreases then becomes constant for short distance.

In accelerated mechanical abrasion, the track left by the abrader has a larger profile than the profile of the contacting part of the abrader.

Seizing may be defined as the state in which the relative motion of the opposing metal parts is stopped, because the track increases in profile to the extent that further propagation requires more translational energy than is available in the system. Galling may be defined as arrested seizing; i.e., the increased track profile becomes constant or decreases with continued propagation of the track, *Fig.* 1. The track here decreases in width, then remains constant for a short distance before disappearing rapidly as the contact pressure is reduced.

Self-lubricated alloys vary markedly from homogeneous alloys, buying less tendency to seize and suffering less damage when galling does take place. The extent of damage from the galling

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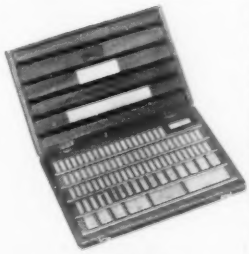

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of cast iron is restricted sharply compared to the damage to steel. The superiority of self-lubricated alloys for this purpose generally has been attributed to the phenomenon of lubrication. However, most efforts by external lubrication fail to duplicate the resistance of the self-lubricated alloys to the incipience of galling, and especially the decreased damage from galling.

When seizing first occurs in metal-to-metal wear, it is evident that a change has occurred from normal to accelerated mechanical abrasion. This change may be analyzed qualitatively in terms of stress distribution at the point of contact being considered, *Fig.* 2.

The surface in accelerated mechanical abrasion appears similar to machining with a cutting tool having a built-up edge, where the built-up edge becomes much larger than the incident asperity.

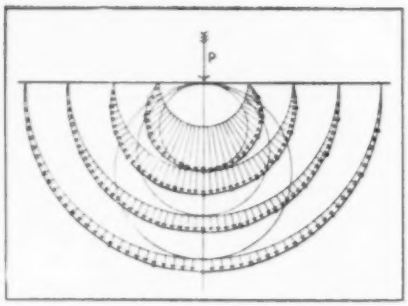

Fig. 2. Distribution of principal stresses for point contact on plane in elastic deformation of homogeneous isotropic medium.

The increase in normal force can continue until the translational force component is comparatively negligible, and relative translation of the two opposing surfaces stops (seizing occurs).

The mechanical analysis of accelerated mechanical abrasion agrees qualitatively with published empirical data on metal wear, with respect to the effect of normal pressure, surface finish, work hardening, temperature, velocity and foreign particles. Most interesting are the effects of surface finish and work hardening.

Effect of Surface Finish

The lubrication theory predicted that the separation of the opposing metal surfaces would be accomplished more easily if the surface finish was improved; i.e., if all the asperities (high spots) were removed. Now it is known, however, that a high order of surface finish increases the tendency for galling and seizing. The mechanical analysis of accelerated mechanical abrasion indicates as shown in *Fig.* 3, that a low-order surface roughness tends to gall because the amount of deformation that will cause instability is reduced so much. This correspondence of the theory with empirical data is one of the principal contributions of the mechanical analysis.

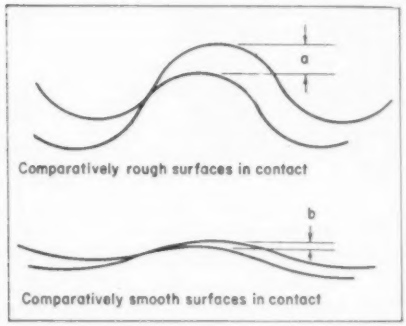

Fig. 3. Effect of surface smoothness. Amount of permissible deformation is approximately proportional to vertical distances, a and b. Rougher surfaces have greater permission deformation before seizing begins than do smooth surfaces.

Effect of Work-Hardening Modulus

It is known that the critical shearing stress for plastic deformation increases with strain; i.e., work-hardening occurs. The metal with highest work-hardening modulus, therefore, would be expected to have the greatest resistance to galling, all other factors being the same. In general, the softer alloys gall more readily than hard alloys.

That self-lubricated alloys have a greater resistance to incipience of galling and a lower extent of damage from galling, is accounted for in the mechanical aspect of accelerated mechanical abrasion. On this basis, porous alloys without a lubricating agent would be

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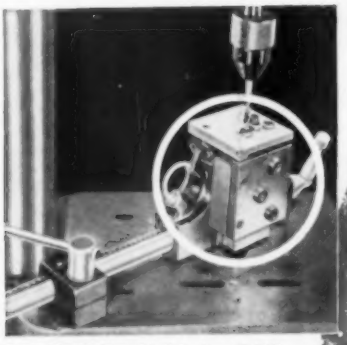

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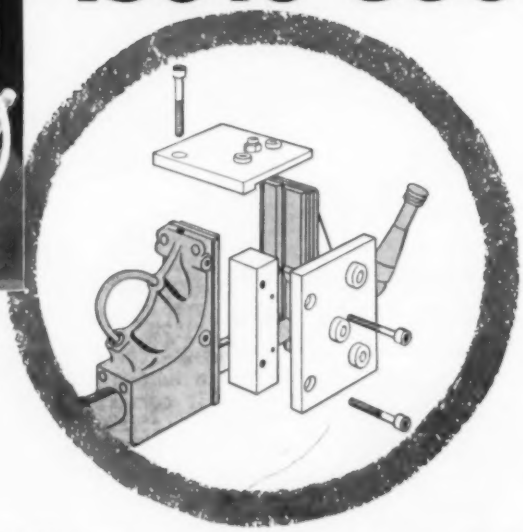

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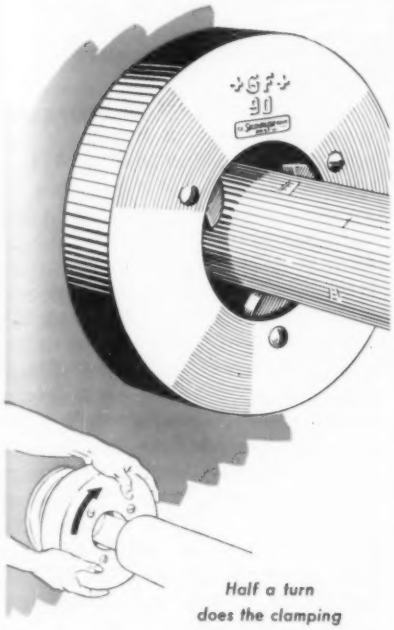

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Technical Digests . . .

expected to gall less than unlubricated nonporous alloys.

The mechanical interpretation of accelerated mechanical abrasion would provide a principle upon which to design surfaces of "engineered roughness." It is evident that the roughness must be on a scale comparable with the asperity (high spots) size; i.e., the microscopic scale. In practice, the importance of graphite-flake size, shape and distribution in gray cast-iron applications is well-known. From the standpoint of self-lubrication, the dimensions of the lubricant reservoir would not be too critical. Yet, actually, the graphite-flake classification is controlled closely for such parts as piston rings, cylinders and other wearing surfaces.

Porous chromium-plated surfaces are superior to the nonporous surfaces in resistance to galling. The effect of size, shape, and distribution of porosity again was found to be more critical than would be predicted from lubrication theory, since channel porosity of the chromium plate is superior to round-pit type porosity.

For proper wearing-in of many metal parts, it is necessary to have good resistance to accelerated mechanical abrasion. Chemically pitted surfaces are known to be superior to superfinished surfaces in many such applications for wearing-in characteristics.

In most industrial applications the mechanical effect is complementary to the lubrication-film effect of separating the surfaces, but somewhat decreases the importance accorded to the lubrication effect alone. There is ample evidence that empirical methods have determined in many cases the importance of microscale engineered roughness, which is predicted (qualitatively, at this time) from the mechanical analysis of accelerated mechanical association. In future surface engineering such interpretations undoubtedly will be tested for quantitative validity.

From a paper presented at the 1953 *ASME* Semi-Annual Meeting, Los Angeles, Calif.

▼ ▼ ▼

Production of Large Forgings and Castings

Panel Leader, G. W. Motherwell
Wyman-Gordon Co.
Worcester, Massachusetts

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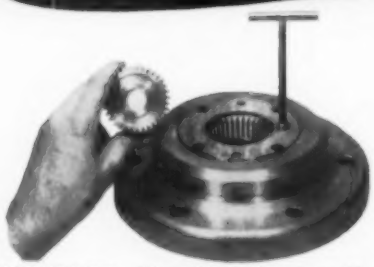

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capacity up to 16,500 tons, are already operating. It is reported that one German extrusion press of 14,000 tons capacity will be in operation this year (1953). The first of the new forging presses is expected to be in operation the second quarter of 1954, with others following.

New Techniques Needed

The design and manufacturing problems encountered in building modern aircraft have been multiplied many times since World War II. More and more performance has had to be built into less and less space. This has called for new design thinking and new manufacturing techniques. Many aircraft builders have turned to large light metal forgings (made on the existing 18,000 ton press) for a particular answer to these problems. Large forgings having high strength/weight ratios make possible designs not otherwise considered producible, while at the same time experienced users cite large savings in man hours and material which result from less machining and simplified assembly. There are many who believe that the liberal use of large forgings would be the only practical way to mass produce modern aircraft in an emergency.

A recent survey of 18 aircraft companies on the West Coast and in the Southwest indicated widespread and practical interest, as evidenced by designs actually on the drafting boards and in the procurement stage. Similar interest is reported on the part of the Mid-west and East Coast builders. Not to be overlooked is the fact that many aircraft companies are and have been using the largest forgings and extrusions obtainable, and expect to use larger ones when the new presses are available.

As regards size, forging operators believe that forgings of average complexity having 3,000 sq in. projected area can be made on a 50,000 ton press. Actual forgings may be larger or smaller depending on relative difficulty of forging.

Closer dimensional tolerances, thinner webs, and smaller draft angles must be listed among the more urgent requirements of the aircraft designer. Press operators face the fact that such factors tend to move in the wrong direction as forgings get larger. They believe, however, that better die lubricants, better die materials, more rigid press structures, use of die quenching where applicable, and other improved manufacturing techniques already well

alone will more than offset the size factor and result in larger forgings to close tolerances.

Presses for Steel

One of the new extrusion presses is being built expressly for steel. There is a need for hollow extruded steel landing gears. The extrusion presses and the large forging presses with side cylinders are expected to make possible hollow formed shapes in steel, with or without attached bosses, tapered sections, etc. Some of the problems in pressing or extruding steel are the result of the high forming temperatures, scale, and decarburization.

If only a few pieces are wanted, dies can be amortized economically in many cases in as few as 15-20 sets of forgings. Where prototype forgings are wanted in quantities of only 4 to 6 pieces, limited tooling (less costly) will frequently suffice to produce a blocker-type forging suitable for the first few pieces. Such forgings offer many advantages over hogging out of slab because of better grain flow and properties, and less machining. One forging vendor reported promising results with cast Kirksite dies reinforced with steel, for producing small quantities of block-type forgings. This method, if successful, promises even lower tooling costs for prototype quantities.

Casting Problems

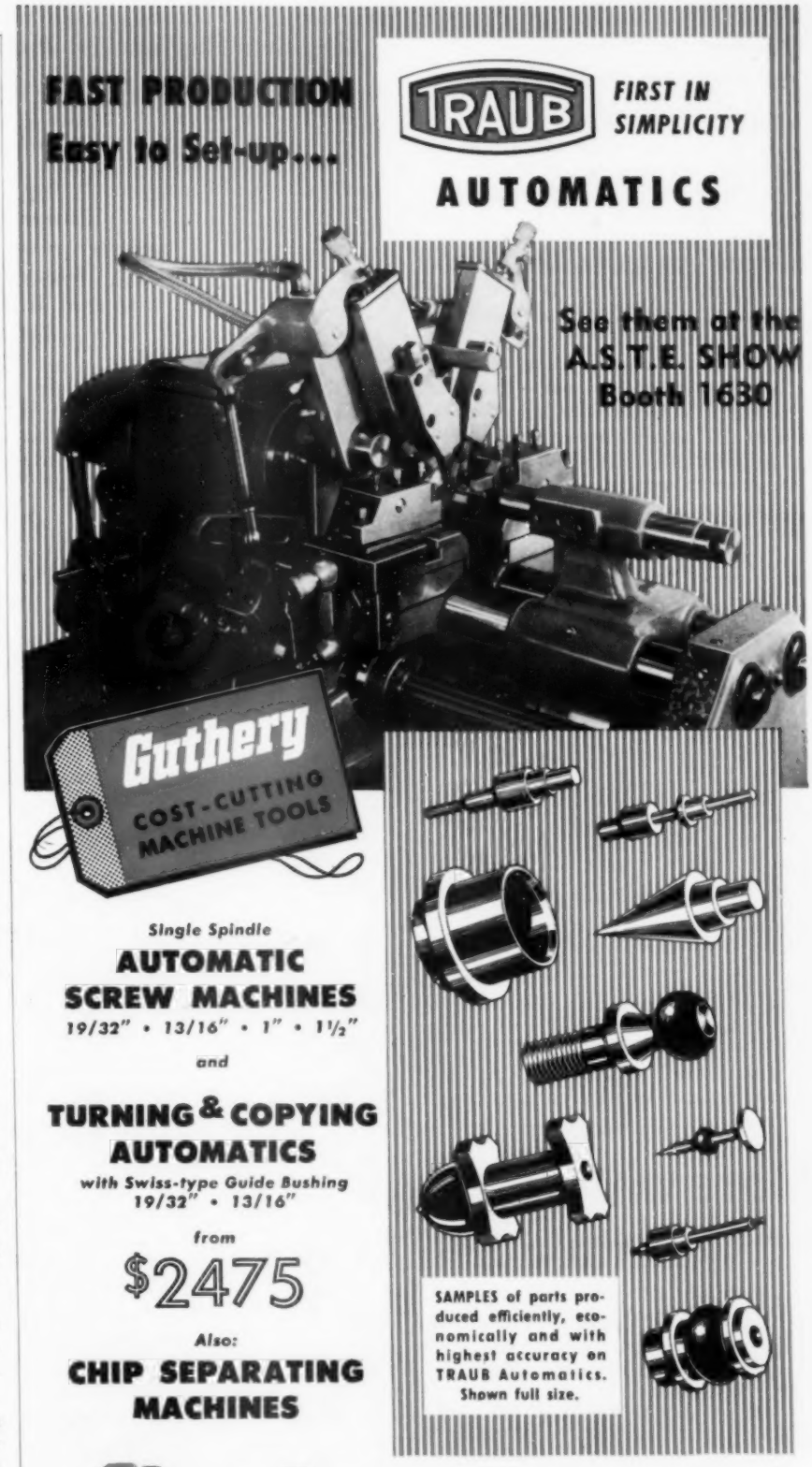
Good aluminum castings of consistent quality can and are being made, but to secure such parts certain common sense rules must be observed.

In the first place, engineering at the customer's plant and at the foundry should get together and determine what is the best design and what is the proper alloy.

In the second place, quality castings should be made by a concern with adequate equipment, experience and personnel.

The size limitation on magnesium castings depends on the part and the casting method employed. A 400 lb undercarriage is being used in England, which is about seven-feet long with an average section of one inch. Many castings are mass produced today in the 100-150 lb range. The largest casting is a 1600 pound base for a radar station.

Minimum wall thicknesses obtained go as low as 0.090 inch. It is reported that a California concern is having some success in this range. A two-foot square magnesium panel has been cast with



walls averaging 0.080 inch.

In the casting field much work is underway all over the country to develop new and better mehods. The frozen mercury and shell molding processes, for instance, are in their infancy, and hold much promise for further development.

Without a doubt, castings find their most important field in aircraft at present in aircraft engines. These are high grade aircraft quality parts. There is developing a tremendous field for so-called "B" grade castings in the field of limited service, one shot use, such as occurs in guided missile service.

From the production forum of the 1953 SAE National Aeronautical Meeting.

▼ ▼ ▼

Adapting Engineered Maintenance to Smaller Plants

by Dr. Charles N. Lanier, Jr.

University of Delaware
Newark, Delaware

and

James D. Quinn

Supervisor, Maintenance Consultants
Engineering Dept.
E. I. du Pont de Nemours & Co., Inc.,
Wilmington, Delaware

With increased automation, considerable attention is being directed towards engineered maintenance in the larger industrial plants. Certain of these techniques are adaptable to maintenance activities in smaller plants and can be used for increasing productive capacity through reducing the maintenance work load in plants having maintenance forces of 10 to 50 men.

A good maintenance program is indispensable since its repercussions are felt in production, profits, and prolonged life. A recent check of published financial reports of about 50 industrial corporations indicated that maintenance and repairs expense is frequently equal to or greater than the corporation's net earnings.

Some practices particularly suitable for the moderate-sized and small plants may not be generally known. It is possible to obtain insurance contracts which will indemnify the insured for losses resulting from equipment breakdown. A heavy compressor or large motor in a manufacturing plant, may be nearly indispensable. The insuring company, to protect its interests, will provide the necessary maintenance for such equipment. Serving many plants, as it does, it can provide this maintenance at a cost below that which might be incurred if each plant were required to maintain its own technicians to do the work.

It is possible, also, to obtain excellent assistance from suppliers of equipment and materials. Training programs are made available by producers of such devices as control instruments and servomechanisms. Furthermore, careful investigation of lubricating needs by a supplier of lubricants might well result in reducing the number of oils and greases required, as well as in selecting the correct lubricant for the job it is expected to do.

The plans for a new plant or for new designs in an expanding plant should be drawn with the maintenance problem in mind. Motors, for example, should not be placed in virtually inaccessible locations. Correct design might just as well place them in a relatively convenient spot. Engineering consultants can be brought in for this purpose where none is available in the plant.

Another source of help for the smaller maintenance departments may be the production-department mechanical development engineer. He can offer his professional advice from a wealth of knowledge of production problems. He

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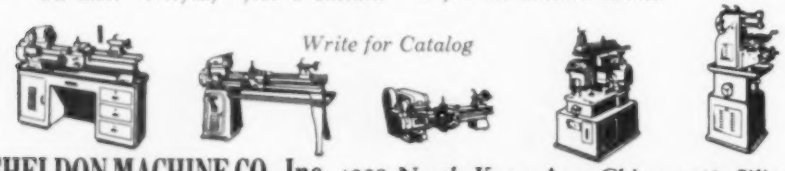

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should be particularly interested in helping to increase production through improved maintenance. Of course, he might have to be educated to the proper respect for the maintenance function, if he fails to give his whole-hearted cooperation.

Still another source of engineering assistance is available from the technical graduate schools. A competent graduate student could spend a summer doing developmental work in the maintenance program for a moderate-sized plant. The results of his work should be beneficial to all concerned.

Regardless of the size of the plant, it is necessary to develop a systematic method of conducting the maintenance operation and to accumulate data if the operation is to be improved.

An order form, *Fig.* 1, should make it possible to classify the work orders

Fig. 1. Order form simplifies paperwork.

by simply checking the appropriate block. By segregating repairs, new work, and services it is possible to draw more valid conclusions about comparative performance. The form also provides space for the appropriate cost code, equipment piece number, estimates, and other pertinent information.

The next consideration is the effective planning of the maintenance work. A system of scheduling work is always desirable but often not considered feasible for small organizations because of the paper work involved. There is a simple method of scheduling that can be used for maintenance groups large or small.

The schedule sheet, *Fig.* 2, can be prepared weekly with a sufficient number of copies to eliminate all daily transcribing of the description of work, codes, estimated hours, and craftsmen's names or numbers, or both. This combined weekly-daily schedule allows sufficient latitude for the foreman to select the men best suited for the work and available on the particular day when the work should be performed.

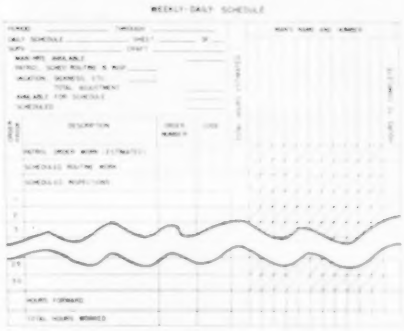
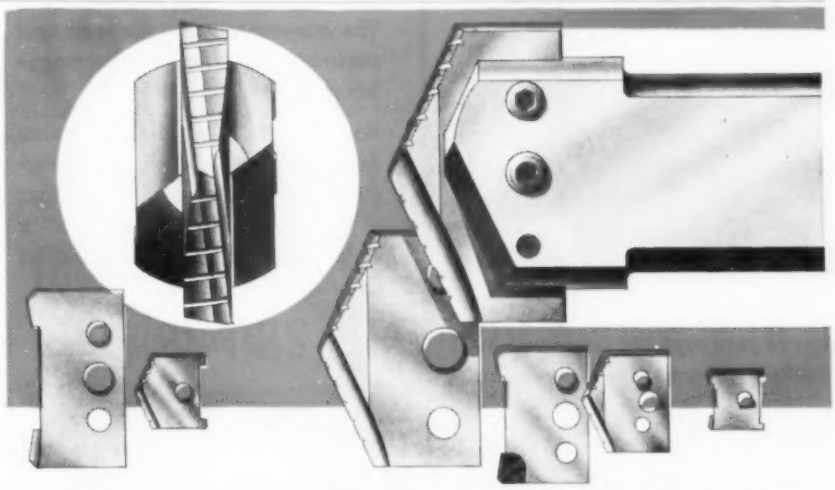


Fig. 2. Schedule form designed to simplify planning of maintenance jobs.

When work is scheduled on a weekly basis, there is adequate time to plan related shop work and to make sure of the availability of material, tools, and equipment.

The third step is the development of an equipment repair history which relates the repair work performed to specific pieces of equipment. Without this, the over-all maintenance repair cost is known, but there is no way of knowing where the work has been excessive, unnecessarily frequent, or to what extent improvements could be justified.

Costs of repairs can be compiled



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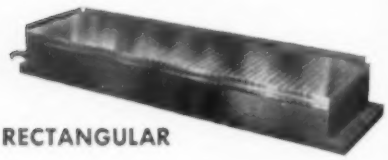

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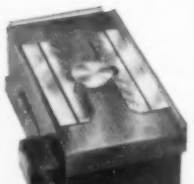

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through accounting, but for a worthwhile analysis of work performed an equipment-history system is required. For the smaller plant a simple form can be used. This requires only a different method of filing completed repair orders. Usually they are filed numerically or chronologically. The only change is to file them by equipment-piece numbers. The equipment-history-file divider card shown in *Fig. 3*, is included in this file.

EQUIPMENT HISTORY CARD

Fig. 3. Form for maintenance analysis.

Of course, it is necessary to accumulate data for a period of 3 months to a year or more depending on the frequency that work is performed before any analysis is attempted.

A careful evaluation will give at least partial answers to such questions as the following:

Can improved design of components or of the unit be considered and justified?

Can the use of improved materials of construction be justified in cases where erosion or corrosion is a problem?

Would improved operating techniques or controls result in less frequent equipment failures?

Should preventive-maintenance techniques, such as periodic inspections, adjustments, or replacement or equipment parts be adopted?

The logical approach can be determined by a comparison of methods and analysis of their cost and effect.

There are refinements such as backlog controls, control charts, and means of applying controls to procedures to audit performance that could be considered for any maintenance operation. The four major points, (1) the classification of work, (2) the weekly-daily schedule plan, (3) the equipment history for analysis, (4) the job procedures for improved performance should provide a sound basic structure for a maintenance operation in the moderate and smaller sized plants—and provide means for development of a balanced maintenance operation.

From a paper presented at the 1953 annual meeting of the ASME.

Evaluating Gear Manufacturing Processes

By William E. Gustin
and
D. C. Smiley
Deere Mfg. Co.
Waterloo, Iowa

The final measure of gear performance depends upon the service life in the field. In some cases this determination may take several years to obtain, therefore, it is important to be able to predict field performance by the less time-consuming laboratory tests. Experience indicates that gears cannot be properly evaluated by metallurgical

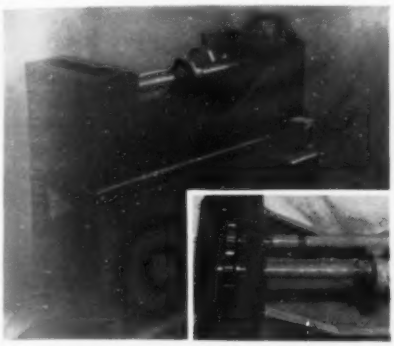

Fig. 1. Gear fatigue test machine.

properties such as surface hardness, core hardness, microstructure and chemistry.

The purpose here is to present data from laboratory tests and field test experience on various gear manufacturing processes to indicate a practical approach to gear evaluation from the standpoint of cost and performance.

Large slow-speed gears, such as the final drive gears in tractors, vary from 14¾ inches to 20¼ inches in diameter, have an average of 70 teeth, and a diametral pitch of 3½ to 5. They rotate at a speed of 10 to 30 rpm and as a class must withstand high beam loads and repeated impact loads. For many years these gears were made of carburizing grade of alloy steel and were direct quenched. By considerable development in heat treatment the gear tooth beam strength was increased from 30,000 to 40,000 pounds. However, the demand for additional tractor power placed still greater requirements on these gears.

As a means of reducing cost as well as increasing beam strength, an induction hardened gear of 1050 steel was developed. TABLE 1 indicates the improvement in beam strength due to the process.

Several years of field experience have indicated that the process is entirely satisfactory and that the laboratory beam strength test is sufficient to evaluate this type of gear.

Table 1—Comparison of Cost and Strength of Final Drive Gears

Size OD	No. Teeth	Static Tooth Strength-lb. 8620 Carb and Direct Quenched	Static Tooth Strength-lb. 1050 Induction Hardened	Percent Increase	Cost saving per piece using 1050 steel Induction hardened Material	Labor	Total
20¼	69	58,400	76,700	31	$2.34	$0.07	$2.41
17½	68	38,500	57,100	48	1.98	0.11	2.09
14⅞	72	37,700	47,600	26	1.17	0.30	1.47

The four-square type of machine, *Fig.* 1, is an economical means of conducting accelerated tests by overloading the gears. It consists primarily of two gearboxes connected with parallel shafts. An adjustable coupling is provided in one shaft for changing the load and a load measuring device is incorporated in the other shaft. This may be a torque meter if accurate determinations of tooth action are desired, or a torsion shaft with a vernier mounted on parallel disks if average torque values are desired. The torsion shaft and vernier design has some merit in that it is trouble free and the indicated torque

Straddle facing and grooving tools made by LEHMANN BORING TOOL enables this engine crankcase to be

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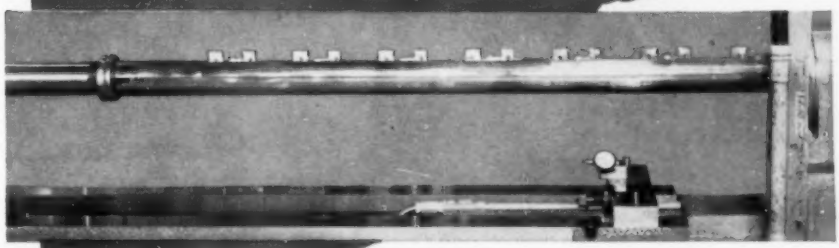

A LEHMANN-made boring bar with 34 synchronized cutters is shown above following the machining of an engine crankcase for the Continental Motors Corporation of Muskegon, Michigan. The blocks and tungsten-carbide cutters are hydraulically raised to groove, face and chamfer the engine's bearing bores. Below is a bottom view of the engine showing the 7 machined bores. The actual machining time is *only seven minutes!*

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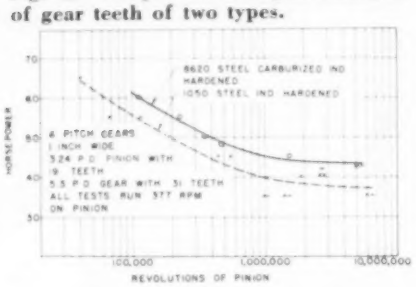
does not change between static and dynamic conditions.

Service life of gears in tractors on transmission dynamometers and on field tests compared to results of tests in the four-square gear fatigue test machine, indicate that the results from the four-square machine are an accurate basis for predicting field service.

The size of the second gear for consideration in the speed change group is 3⅝ inches in diameter, has 19 teeth and a diametral pitch of 6. The two processes for this comparison are 8620 steel carburized and induction hardened and 1050 steel induction hardened. The S-N curves for these two processes are shown in *Fig.* 2; here again the 1050 steel induction hardened shows a lower endurance limit, and the failures in the lower loads were of a pitting nature.

Fig. 2. Comparative fatigue strength of gear teeth of two types.



No evaluation of gear processes is complete without a cost comparison. The cost of the material and heat treating only on each of the three processes is shown in TABLE 2. Obviously where the gear is applicable 1050 steel, induction hardened only provides the cheapest process. There are, however, few applications in speed change gears where the 1050 steel induction hardened is satisfactory from the standpoint of wear and pitting in service.

The major heat treat equipment for the 8620 steel, when carburized and direct quenched, is the carburizer while the 1022 steel requires the carburizer plus the induction hardening equipment. This cost of the induction hardening equipment must be offset by the reduction in price of material, by the improvement in bore dimensions, and by improvements in service life.

Summarizing experience in correlating laboratory gear tests with field experience, it has been found that induction hardened 1050 steel with a 500 F temper produces a strong, impact resistant gear for slow-speed operation. This process also provides a substantial cost reduction over 8620 carburized and direct quenched.

Beam strength tests in the laboratory are a practical, accurate measure of field service on this type of gear.

Induction hardening a ring gear improves the out-of-roundness by approximately 40 percent over direct quenched ring gears and thereby reduces assembly stress by 55 percent, for the same amounts of shrink fit. The induction hardening provided 100-percent improvement in service life as compared to direct quenching.

For gears subject to many millions of revolutions at relatively high loads carburized, air-cooled, induction-hardened and rebroached gears have the following advantages:

Straight spline bore.

Better resistance to wear.

Better resistance to pitting and fatigue.

The process can be used on a variety of steels: carbon steel to reduce cost, substitute steels in cases of emergency.

Laboratory fatigue test results in the four-square machine can be correlated to field service. Beam strength tests do not provide a measure of the service life of speed change gears.

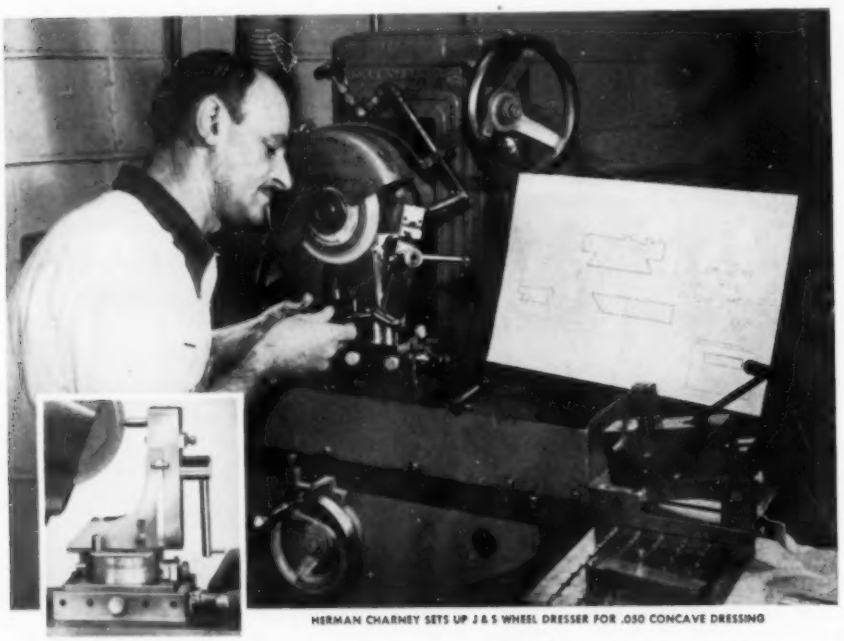
Fatigue life of speed change gears is not directly related to core hardness, that is, low core hardness may give good wear and fatigue life.

Table 2—Comparison of Cost on Medium Size Spur Gears

	Cost per Piece		Total Cost Material and Heat Treatment
	Forging Material	Heat Treatment	
8620 Carb. and Direct Quenched	$1.123	$0.095	$1.218
1022 Carb. and Induction Hardened	.936	0.182*	1.118
1050 Induction Hardened	.929	0.094	1.023

*Includes rebroaching operation.

From a Paper presented at the 1954 SAE Annual Meeting.



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re Thread Inserts for gnesium Applications

by Paul E. Wolfe

Heli-Coil Corp.
Danbury, Conn.

Magnesium will corrode when in contact with stainless steel in the presence of a strong electrolyte. However, corrosion has not occurred in actual service, especially when corrosive conditions were anticipated and recommended processes were used to prevent corrosion.

Stainless steel wire thread inserts have been used successfully in magnesium castings for over 10 years. Pratt and Whitney, with hundreds of parts in service for this period of time, advises that field service reports indicate no failures due to corrosive action between magnesium and the inserts.

Cadmium plating in contact with magnesium causes some corrosion in the presence of an electrolyte, but to a lesser degree than that caused by stainless steel. Where a mild electrolyte is present this difference is reduced considerably. This difference, however, between the cadmium plating and stainless steel may become more significant under the circumstances of an open hole where the electrolyte or corrosive solution can have easier access to the dissimilar metal area.

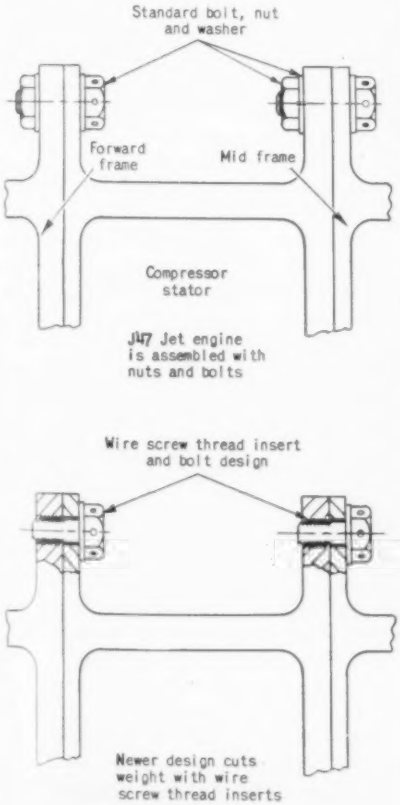
In most assemblies, the bolt head, the washer and the clamped member combine to effectively seal off the insert, the bolt threads and the tapped threads from exposure to corrosive elements.

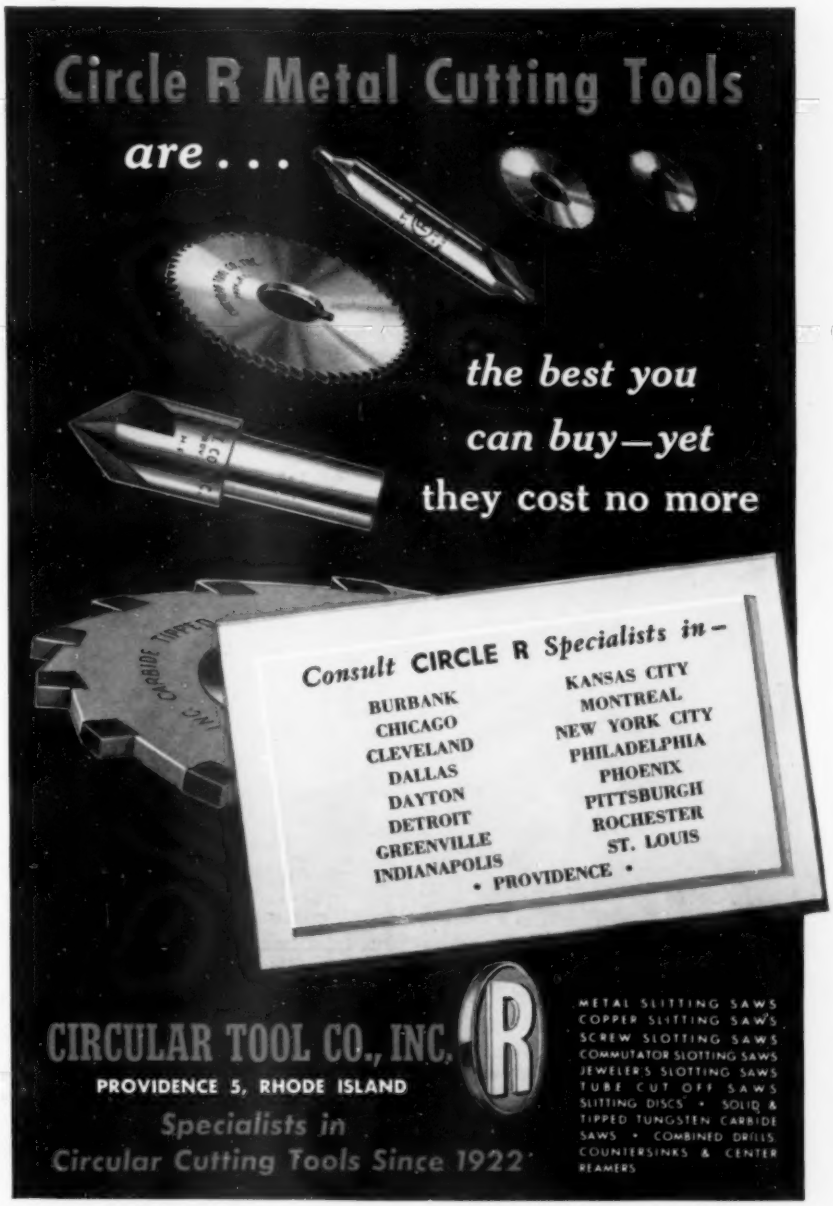
Most customers use zinc chromate primer between the threads of the magnesium material and the wire thread insert. The primer used for this purpose usually conforms to MIL-P-6889A. Type 1 and 2. This primer helps to keep moisture from entering the thread area.

If some of the corrosive solution or electrolyte seeps past the bolt head and washer and causes a slight corrosion of the magnesium adjacent to the insert, the insert is only locked more firmly in place. The corrosion produced under these particular conditions does not interfere with the action of the bolt. Unless fresh electrolytes come into this area, corrosion will eventually cease.

In an improved major structural design, right, *Fig.* 1, bolts join three sec-

Fig. 1. Design advantage gained by use of wire thread inserts in jet engine assembly.


Standard bolt, nut and washer
Forward frame
Mid frame
Compressor stator
J47 Jet engine is assembled with nuts and bolts
Wire screw thread insert and bolt design
Newer design cuts weight with wire screw thread inserts



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tions of the engine together with wire screw thread insert instead of the locknut. This design configuration saves approximately 15 pounds per engine by eliminating over 100 AN locknuts and shortening over 100 NAS bolts. The total weight saved in a newer model engine is approximately 25 pounds, which does not include weight saved due to reduced boss diameters in the casting design.

In addition to weight saving illustrated in the preceding example, there is another saving available to the designer, *Fig.* 2. Here the difference in boss metal required by the use of a solid insert, commercial type, is shown on the right versus the use of a wire screw thread insert as shown on the left. While the difference of 3/16 inch in this typical detail may not appear important at first glance, it can amount to an impressive saving when multiplied many times in an airframe, jet engine or other airborne equipment. The solid insert shown weighs about four times as much as the wire screw thread insert for the same size and length.

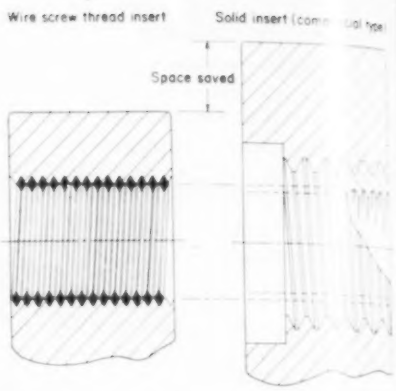

Fig. 2. Space advantage gained by use of wire thread inserts, compared with solid inserts.

Users of inserts, especially structures engineers and stress analysts, have from time to time performed laboratory tests before specifying inserts in primary structural applications. Many such tests, made public now for the first time, have been summarized and combined with similar tests by the manufacturer to provide summary data, *Figs.* 3 and 4. These show the higher loading strength obtained by the use of wire thread inserts compared to a standard assembly. The magnesium alloys selected for these tests were those most commonly used by industry. These tensile and torsion tests were performed at room temperatures on a Tinius Olsen Strain Instrument, Model C-3, and conventional Sturtevant Torque Wrenches. The elevated temperature tests utilized a Lepel Hi-Frequency Induction Heating Unit.

Thread engagement length of all the assemblies in the 1/4–20, 1/4–28 and 3/8–16 sizes was equal to the nominal diameter of the bolt. This short thread engagement was used to show that the wide screw thread insert in most cases would realize the full strength of the bolt with a comparatively limited length of thread engagement. The standard assembly would not realize the full strength of the bolt and, in most cases, the material would strip out, as shown in column headed *Type of Failure.* Under note in Item 4, the minimum ultimate tensile strength for each material is listed.

The rare earth alloy used in the elevated temperature tests, (EK30A-T6) exhibits desirable characteristics at elevated temperatures. Although it has a tensile strength of only 20,000 lb at room temperature, it retains more of its strength at 500 to 600 F, than certain other alloys having higher tensile strength at room temperature.

Observing the higher loading made possible by the use of wire thread inserts, in comparison to standard assemblies, perhaps an explanation of the reaction of the insert when put under

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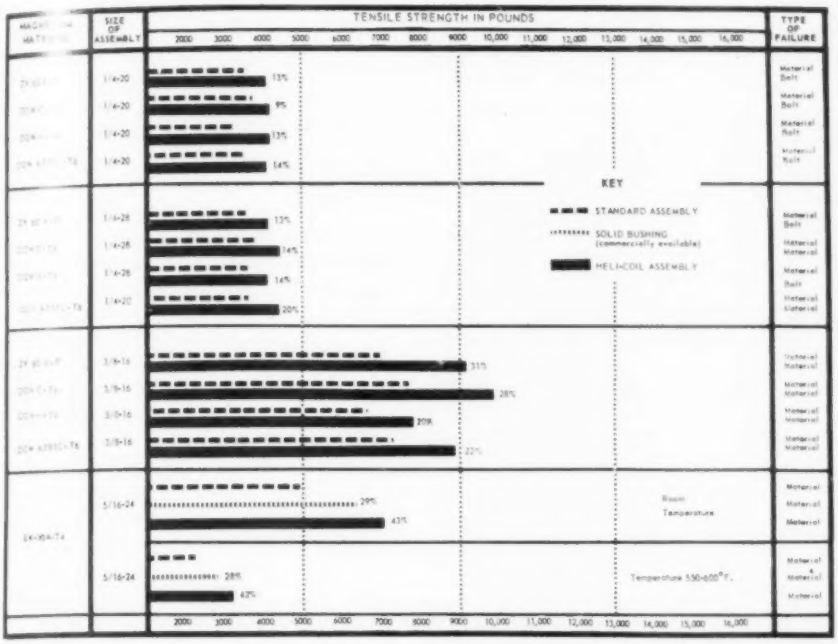
load in order.

The coil acts as a compensator, spreading the stresses more evenly over all the threads, while the standard assembly or solid bushing under load concentrates the stresses on the first thread or two. The final chart, *Fig.* 4, shows a summary graph on torque tests in inch pounds.

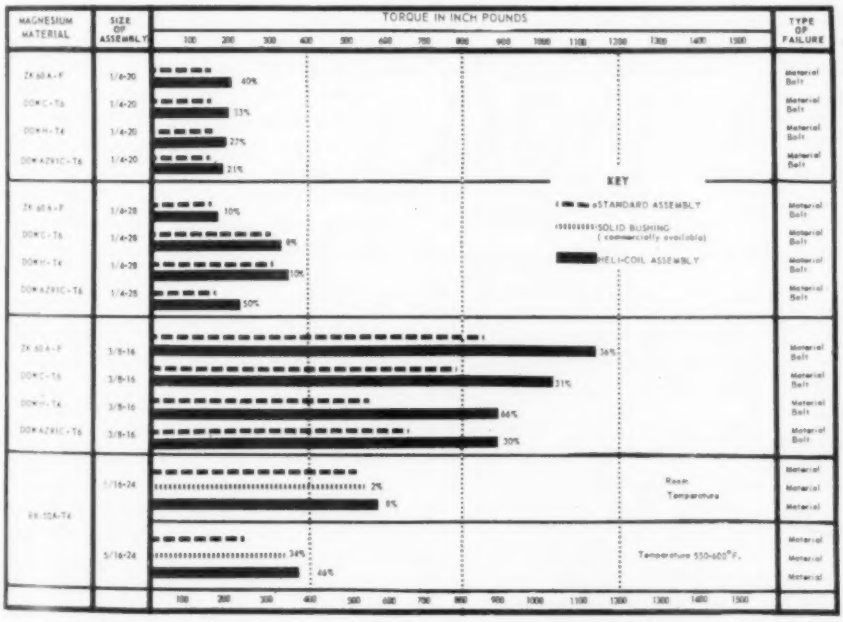
Fig. 3. Heli-coil assembly vs. standard assembly—tensile test.



NOTE

1. All assemblies gage to unified Class 3B fit.
2. Tensile strength for bolts:
   1/4—20—ultimate T.S.-3360
   1/4—28—ultimate T.S.-4080
   5/16—24—ultimate T.S.-6500
   3/8—16—ultimate T.S.-10-100
3. Thread engagement on assemblies 1/4-20, 1/4-28, 3/8-16 is 1 dia based upon nominal dia of the bolt, 5/16-24 th'd engagement 1 1/2 dia
4. Ultimate tensile strength minimum for each material is:
   ZK 60 A-F—40,000
   DOW C-T6—34,000
   DOW H-T4—34,000
   DOW AZ91C-T6—34,000
   EK-30A-T4—20,000

Fig. 4. Heli-coil assembly vs. standard assembly—torque test.



NOTE

1. All assemblies gage to unified class 3B fit.
2. Min minimum wrench torque
   1/4-20—
   1/4-28— 120 in. lb
   5/16-24— 270 in. lb
   3/8-16— 460 in. lb
3. Thread engagement on assemblies: 1/4-20, 1/4-28, 3/8-16 is 1 dia based upon nominal dia of the bolt, 5/16-24 th'd. engagement is 1 1/2 dia
4. Ultimate tensile strength minimum for each material is:
   ZK 60 A-F—40,000
   DOW C-T6—34,000
   DOW H-T4—34,000
   DOW AZ91C-T6—34,000
   EK-30A-T4—20,000

From a paper presented at the 1953 annual Meeting of the Magnesium Association.

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1/8"	17/64"	2"	3 1/8"	17/64"	800	10.50
1/4"	17/64"	2"	3 1/2"	17/64"	700	13.50
1/4"	1/4"	2 1/2"	4"	1/4"	700	16.50
5/16"	9/32"	2 3/4"	4 1/8"	9/32"	600	19.50
11/32"	11/32"	2 7/8"	4 1/4"	11/32"	600	22.50
3/8"	11/32"	3 1/8"	5"	11/32"	500	25.50
13/32"	13/32"	3 1/4"	5 1/4"	13/32"	500	28.50
7/16"	15/32"	3 1/2"	5 3/8"	15/32"	400	31.50
15/32"	15/32"	3 5/8"	5 3/8"	15/32"	400	34.50
1/2"	1/2"	3 7/8"	5 7/8"	1/2"	450	37.50
1 1/16"	1 1/16"	4"	6 1/8"	1"	500	41.50
1 1/8"	1 1/16"	4 1/4"	6 3/8"	1"	200	45.50

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Selection and Training of Engineers

by John Gammell

Supervisor, Sales Training
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Milwaukee, Wis.

Most engineering executives regard selection and training as one of the most important activities with which they are concerned. Great stress is now being put on this matter. The competition is keen, starting salaries are high and recruiting is difficult. Emphasis must be put on training and placement in order to fit inexperienced men into responsible jobs. The country's world position makes it imperative that a top job be done of developing engineering resources.

American industry now hires one engineer to approximately every sixty production workers. Fifty years ago, the ratio was something like one to every two-hundred and fifty, per an Engineers Joint Council report. According to recent statistics the number of chemists is doubling every fifteen years, the number of physicists every eight years. This increased demand translates itself into spectacular salary advantages for engineers.

The January, 1953, Management Record of the National Conference Board points out that the average engineer receives a beginning salary of $334; whereas, the average A.B. degree man receives a beginning salary of only $308 and rates are still changing upward, further widening the gap.

Selection Problems

Consideration of these facts brings on problems for the recruiter and the industrial trainer. His selection methods must be geared to the new condition. His training and placement methods have to be better in order to more effectively use people whose talents are less obvious than he has been accustomed to dealing with in the past.

This can best be illustrated by a discussion with an executive who suggested that recruiters might not know how to select an engineer of personality and technical competence. It turned out that his idea of the type of man who should be hired was a tall, personable, Tau Beta Pi, who had been captain of the football team, president of the senior class and a leader in the glee club.

The chance of getting enough recruits of this caliber on which to run a company is exceedingly slim. The problem of the recruiter and trainer is, in addition to persuading the few outstanding people to come with his company, to keenly appraise those available to him and, perhaps, select someone whom other recruiters might reject. Then, with a skillful and patient training, bring that man to a point of high usefulness.

It would seem that few recruiters would have selected Theodore Roosevelt, Steinmetz or Edison as employees.

How to select people suffers from amateur expertness—like global war strategy or national affairs—everybody is an expert.

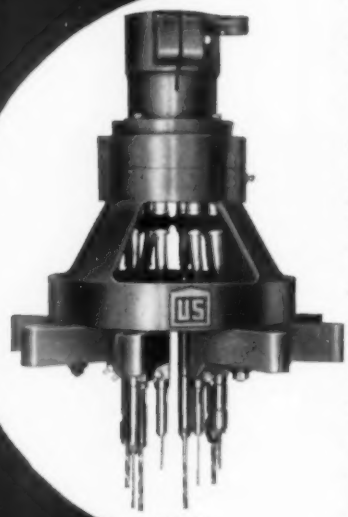
The first item to consider is a man's grades. If a man has high grades, there must be a good reason to refuse him a bid. If he has low grades, there must be a good reason to accept him.

A second item is a man's activities. This is difficult to weigh and depends on circumstances.

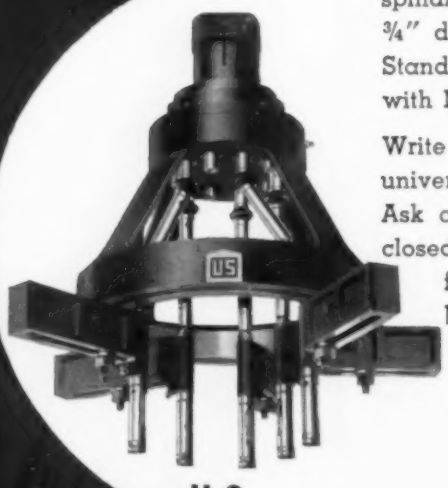
A third item is a man's personality. This is most difficult.

There are some indicators often used. For instance, if a prospect's family was well educated but the man's grades seemed low, it might be discounted. If a man lacked personality but was the son of a minister it could be assumed he had much social experience.

KEEPING UP WITH THE JONESES



U-1



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Selection methods with regard to details are best left to the individual recruiter's ideas. It is just as well that they do have differences, particularly in large companies where different types of men are needed.

Training

After these men are in the plant, the problem of training and placing them in the job where they can do the most good for themselves and the company is highly important.

To overcome engineers' tendency to awkwardness in writing and speech, it is most essential that any training put particular emphasis on these two points. One of the most persistent complaints about engineers which is heard from the layman is that he is an uninteresting fellow who does not write well and talks worse.

Another necessity for good training of engineers is to somehow inculcate in them the fact that commercial necessities and economics are important components of what they do.

It is necessary in industry for a student to learn how to work. The student up to this time in his life has lived in a world where he has been the center of attention. When he comes into industry, he is on the outside of the circle and has to fight his way in. Most industries comprise, essentially, a group of people who are struggling hard to make a good living for themselves by their collective efforts and they do not readily accept an outsider unless he can help them to improve their lot.

In school, there is a definiteness about a student's activities. He knows approximately what he is going to do in his senior year, when he is a freshman. If he goes into a math class, he knows that mathematics is going to be discussed not something else.

When he takes a job in industry on a professional level, however, he does not know whether the problems he has each day will be in the field of human relations, mathematics, or something else.

These are strange concepts to a student who has, during his school life, been told each morning of problems to work and of experiments to do. There is, also, in industry a large measure of routine work which even the highest-priced placed individual has to endure. It is said of the President of the United States that considerable time each day has to be spent in the purely repetitive task of signing his name.

From a paper given at 1953 Management Conference of ASME, Detroit, Mich.

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Ohio State University
Columbus, Ohio

Simplified drafting procedures have been extensively used ever since our American Drawing and Drafting Standards were developed. Most certainly they will be expanded and altered as necessary to meet the needs of industry. Messrs. Healy and Rau have pioneered in some interesting applications of simplified drafting practice in the General Electric Company. They have aroused a value consciousness that merits wide consideration. Where possible, their methods should receive recognition for inclusion in our new American Standards.

The question is frequently raised why such drawing methods are not being taught in the engineering schools. Or on the other hand why educational institutions are not pioneering in the development of these techniques. The answer, of course, is that the problems of industry and of education are not directly comparable.

Engineering colleges should stress the use of more freehand sketching on nonactinic grid-lined paper, simplified delineation, and elimination of unnecessary detail; but must be ever watchful against over simplification, especially in the early stages of a student's course of study. Accuracy should not be sacrificed for speed. The language should be taught first, and then the various idioms of expression.

By avoiding repetitive processes, and through the use of practical material, the student's interest can be held. He must receive a thorough grounding in fundamentals and always with clearly stated objectives before him. At the other end of our field the application of graphic methods to the interpretation of experimental data should be developed.

Good comprehensive examinations, with more practical problems, should be employed to awaken originality and creative thought within each student.

Schools must keep abreast of industry by assisting the men of industry in the preparation of new standards, new texts, and co-ordinated audiovisual material. Teachers must ever be conscious of the fact that what they are doing today should in no measure cause them to think that perfection has been reached.

From a paper presented at the 1953 annual meeting of the ASME.

Plastics Machinery Developments

by R. W. Powell
Hydraulic Press Mfg. Co.
Mt. Gilead, Ohio

Injection molding machine developments have been by far the most active in the field of new ideas, although there are many interesting developments in extrusion, vacuum forming, blowing, and other allied processes.

In the category of injection molding, the greatest activity during 1953 has occurred in four distinct phases.

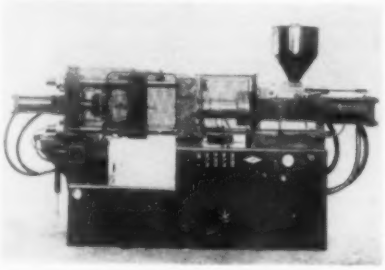
Small automatic machines, designed to operate on an extremely fast cycle with lower mold and labor costs.

Preplasticizing machines, large and small, providing faster cycles and better physical specifications in the molded parts.

Improvements in existing machine designs, particularly more efficient heating chambers which permit faster cycles, lower temperatures, and less injection pressure.

Auxiliary equipment such as weigh feeders, hopper driers, built-in hydraulic core-pulls, hopper loaders, mold elevators which have been designed to lower the manufacturing costs for the injection molder.

This 4-ounce injection molding machine is manufactured by Improved Machinery Company of Nashau, New Hampshire. It has the general appear-

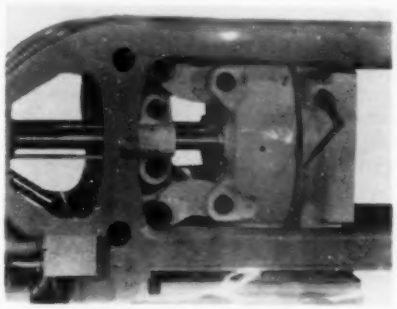


ance of a semiautomatic injection molder, but in addition it can be equipped with the necessary controls to provide fully automatic operation with low pressure mold protection. By employing prepacking, the machine can actually mold 6 ounces per shot. Injection pressure on the material is 21,750 pounds per square inch. The machine is classed as a high-speed unit, having a 7½-second dry cycle time. The plasticizing capacity is 60 pounds per hour.

The accessibility under the mold mounting space is highly desirable for easy mounting of molds, ample clearance for ejection of parts and plenty of space for installation of auxiliary equipment such as core-pulls.

The machine incorporates a hydraulic retractable clamp and die head rather than a retractable injection unit. The mold clamp is operated by a hydraulically actuated toggle mechanism.

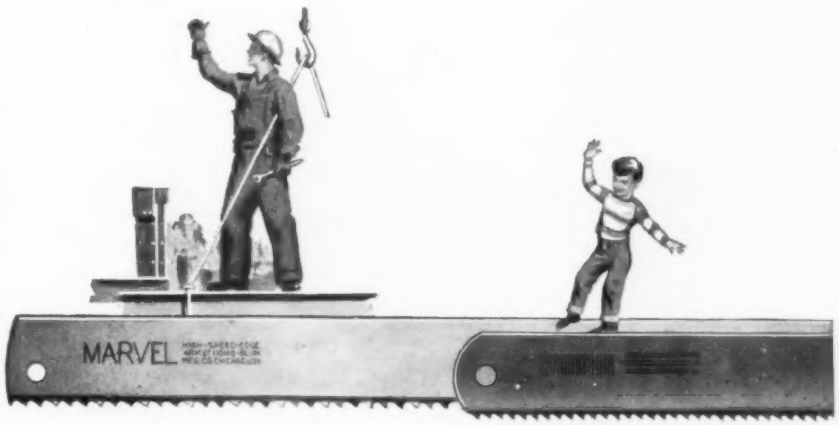
Here is an illustration of Lester-Phoenix's new platen suspension design which has been used on the smaller



Lester machines for some time. The company reports that they are incorporating this design into larger equipment. The movable platen is totally free for mounting molds without any limitation by either tie bars or gibs. In this design the platen is supported on hardened gibs underneath the frame. It is claimed by the manufacturer that this design gives increased accuracy in closing and opening the molds, at the same time it adds considerably to the convenience of designing and mounting molds.

In the larger capacity injection molding machines, this 60 ounce H-P-M giant is a new design, incorporating a 1200-ton mold clamp and will accommodate a mold size of 48 by 60 inches.

One of the outstanding features of this machine is its high-speed injection. Employing a 100 hp-motor and a 110-gallon per minute high-pressure pump, this machine has an injection capacity of 3000 cut in. per minute into the mold. This is approximately twice as



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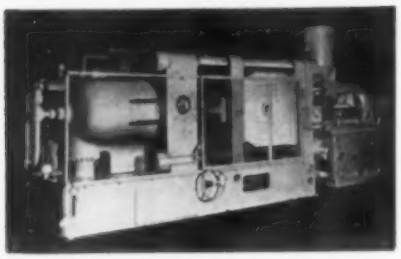
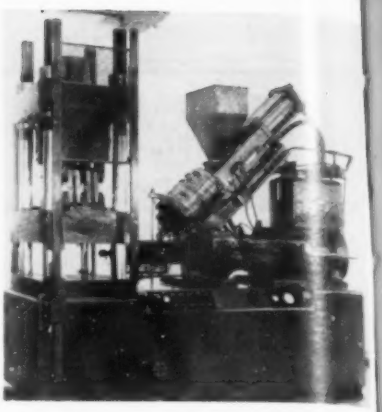


fast as previous 60 ounce designs and permits the conversion to pre-plasticizing (200 ounce capacity) with proper injection speeds for these large capacity shots.

Another unique feature of this design is the two-piece construction with the injection unit being entirely separate from the mold clamping unit, thus permitting great freedom in conversion to pre-plasticizing or longer heater designs or any similar modifications if future developments will make present-day designs obsolete.

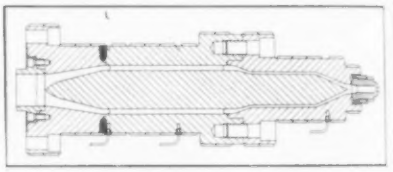
Here is a piggy back machine with the pre-plasticizing chamber mounted at an angle above the injection sleeve. A vertical, downward acting toggle operated mold clamp is employed with



injection at the parting line of the mold. The plasticizing unit has a capacity of 150 pounds per hour, and there is a check valve connector between the plasticizing chamber and the injection sleeve. The machine has an injection capacity of either 50 ounces or 80 ounces, depending upon the injection plunger diameter.

Probably no other part of the injection machine has had as much attention by design engineers as has the plasticizing chambers. This is really and truly the heart of any injection molding machine, as the rate of plasticizing material is one of the key points in the evaluation of a good machine from a mediocre machine. Those who are injection molders are well aware of the big race that is continually going on in the development of higher capacity plasticizing chambers.

Illustrated is the latest H-P-M chamber design which is being used on 9, 16, 32, and 60 ounce machines. Prototypes



of this chamber have increased plasticizing capacity as much as 100 percent over previous designs. In addition, heats have been lowered approximately 100 F, with injection pressures reducing as much as 3,000 psi. A quick glance at the chamber design will show that the basic chamber is made from three pieces, namely, the front housing, the torpedo or spreader, and the rear housing. The rear housing is welded to the torpedo and the front housing is bolted to the torpedo and the three pieces make an integral unit without the need of a retaining sleeve and its inevitable heat loss air gap. Band heaters are employed over the entire length of the chamber with a concentration of wattage at the back end of the chamber.

From a paper given before the New England Section of the Society of the Plastics Industry at Manchester, Vt., Oct. 1953.

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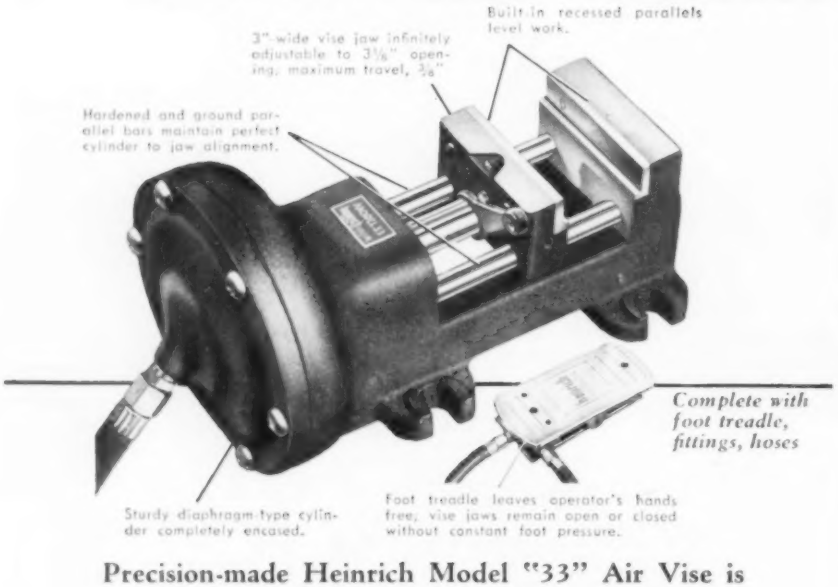
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Location of Machine Tool Controls

By Dickey Dyer
The Work-Factor Co. and
W. H. Compton,
Wood Compton Co. Cleveland, Ohio

Proper arrangement of controls and meters is most essential in order to fully utilize the human efficiency of the machine tool setup man, operator, maintenance electrician, or mechanic.

In the layout of the machine tool for the best man-machine combination, six factors should be considered.

All controls and meters should be located within a practical working distance from the operator.

Within the practical working distance each control and meter should be located in the position where is may be most efficiently used.

Where two or more controls or meters have the same optimal position, the most important and most frequently used items should be given the preferred positions.

Controls and meters should be grouped in patterns that make for the easiest operation and observation from the point of view of the operator.

Other parts of the body should be utilized when the hands are overloaded.

Any possible confusion of controls or meters by the operator should be avoided by proper design or placement.

One method of determining the reach of the human to be considered is to use the data on body sizes collected in various anthropological studies. The normal and maximum working space of the human who is standing is shown in *Fig.* 1. This same area is also available to one who is sitting. A view of the available reach of most human beings in the horizontal plane appears in *Fig.* 2. Here the semi circular arcs of the maximum and normal working areas are most clearly defined. These areas

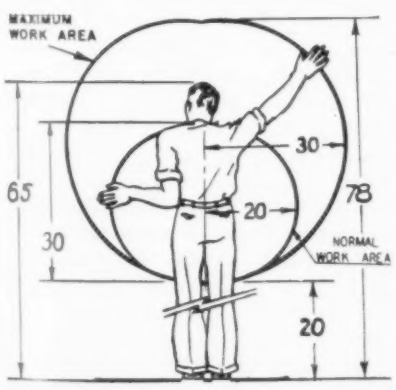

Fig. 1. Width and height of normal and maximum working areas in the vertical plane. Eye level is at 61 inches.

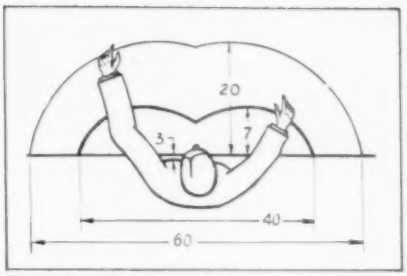

Fig. 2. Width and depth of normal and maximum working areas in horizontal plane. Dimensions indicate location of area that can be reached.

are for an operator who is standing in a fixed position without moving his trunk. Dimensions shown are based on minimum instead of average, in order to accommodate 95 to 97 percent of all humans.

Man is more than just hands, fingers and arms. He also has a trunk, knees, legs, and feet to operate controls. Locations of these are shown in *Fig.* 1 also, where range of the normal and maximum working areas is shown for the vertical plane.

The location of the knee is about 13 inches from the floor, pivoted at the hip, which is 32 inches high. If he is located on a seat 30 inches high, he can operate in the same range as an individual who is standing on his feet. In

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this particular case it is well to provide a footrest. When one is sitting, part of the working area is eliminated by the knees.

The allowance for fatigue is reduced 40 percent when an operator is seated. Chairs which are well designed for sitting comfort and are easily adjusted for the operator to work in the same area whether seated or standing are on the market.

Although people respond 40-percent faster to audible than visual signals, meters and indication lights are the most common signals for machine tools.

Under the most extreme conditions of head and eye movement, with the body fixed in position, the average operator can fixate his eyes from 90 deg above the horizontal to about 90 deg below and at least 90 deg to either side. Unlimited head and body movement will permit vision in almost any angle. When the eyes are fixated on any one point, only a small area within one and one-half deg of the point of fixation is in clear focus. The area that is only five deg from the point of fixation is only one-half as good. The remaining surrounding area is divided into two fields, which are the binocular vision and the monocular vision shown in *Fig.* 3. In order for a signal to be seen, it must be within the total range of these fields.

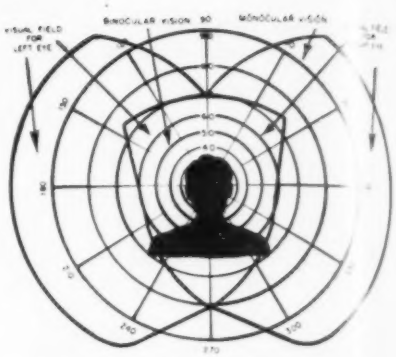


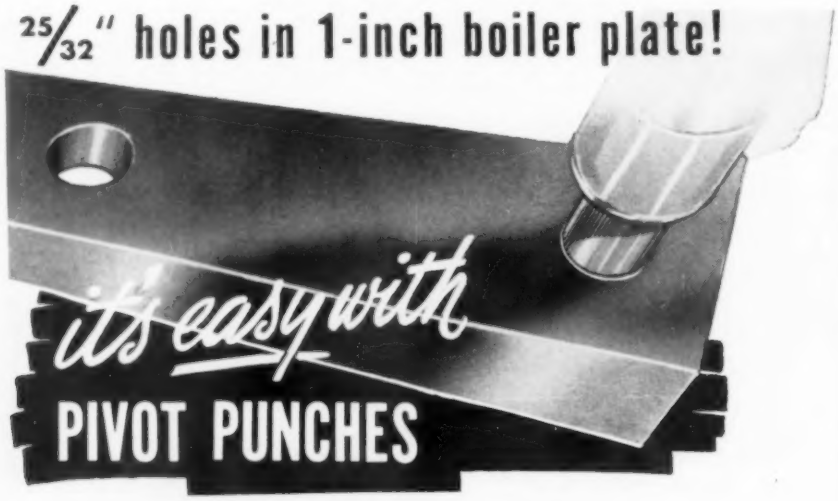
Fig. 3. Visual field for two eyes, showing total range of both eyes and binocular vision when fields of both eyes overlap.

To determine the best location for one particular meter, one must first determine where an operator's visual point of fixation will be at the time that he requires metered information. Load meters for each milling head of large planer millers are usually at the point of work. There is no question that a large milling machine requires a pendant station, but usually there is a question regarding smaller machines. What functions are to be provided such as remote controlled variable speed are also a question that could be solved more easily with the proper use of established time-study work factors coupled with past experience.

There is considerable material available as to design of meters depending on the operator's required accuracy of response and precision.

It is entirely practical to evaluate economics of placing machine tool controls within the normal working area as described above, since time standards can be developed for use of controls as they are presently placed and these can be compared with time standards developed for use of controls as it is visualized they might be placed within the normal working area. The differences in time standards for use of controls placed at the point of machine action and placed within the normal working area can be established from these two prior determinations and then the dollar savings in operation of the tool can be determined by pricing out this difference at prevailing wage rates and multiplying the answer by anticipated frequency of use of the controls.

From a paper given at the 1953 Annual AIEE Special Conference on Machine Tools, Cleveland, Ohio.



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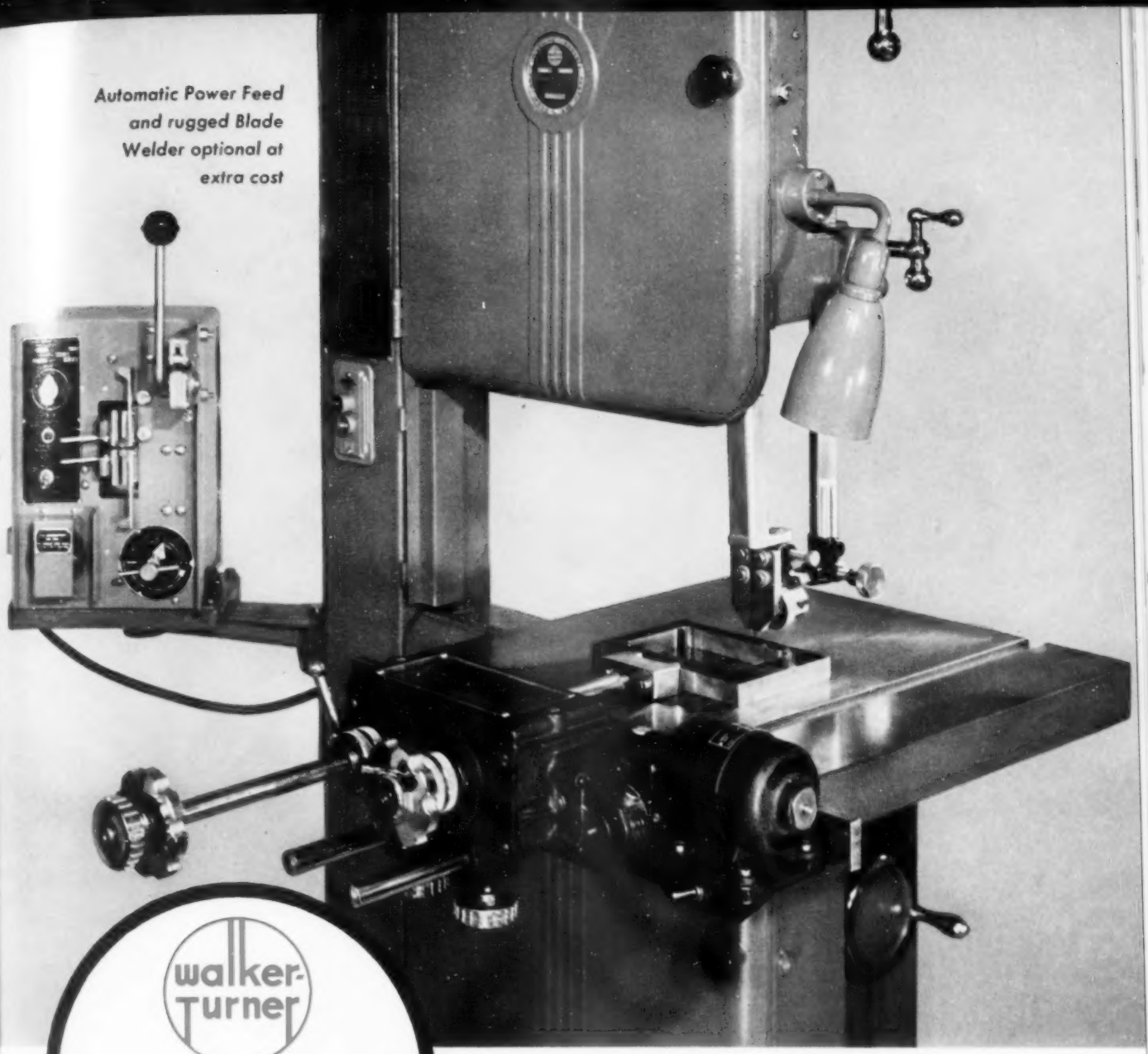

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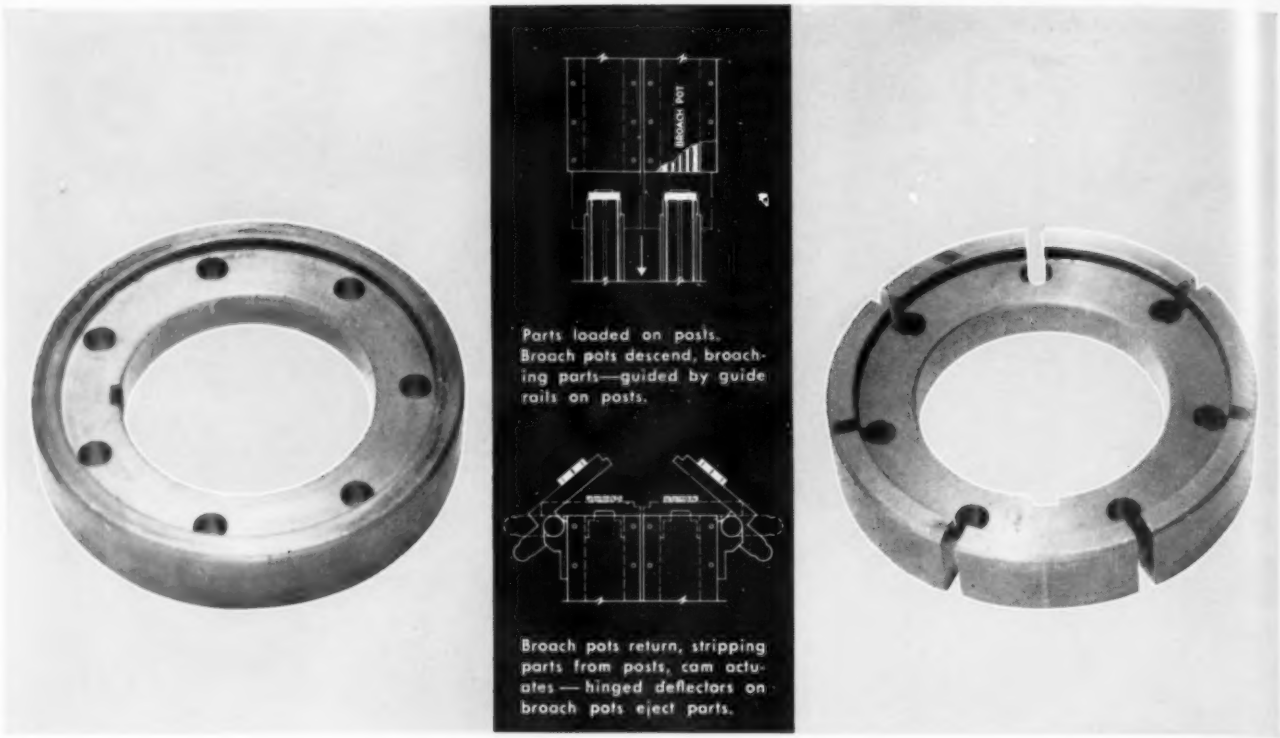
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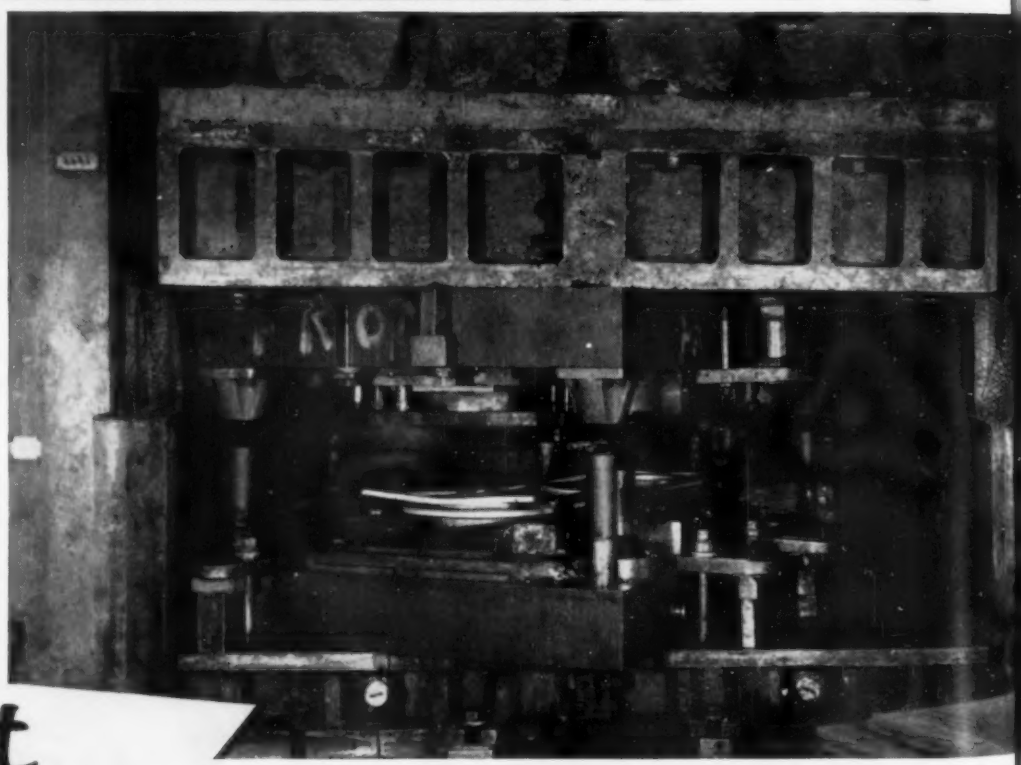

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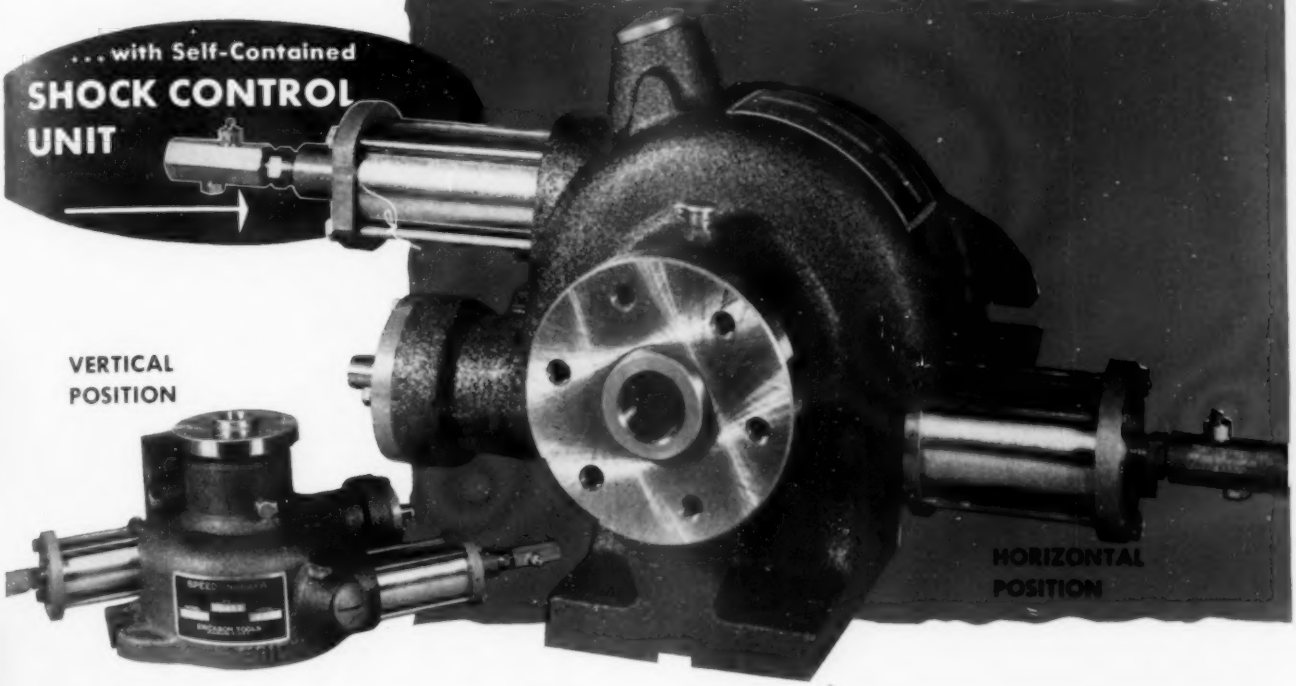

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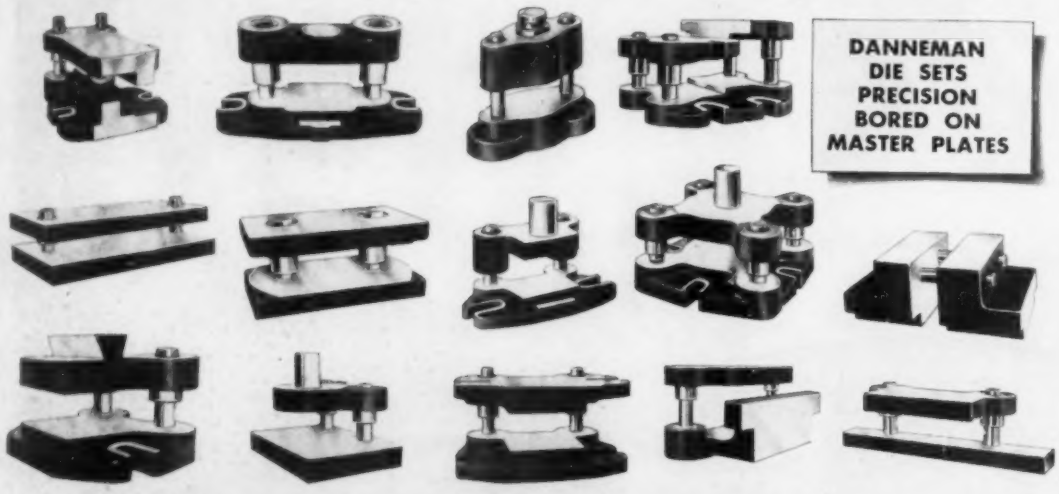

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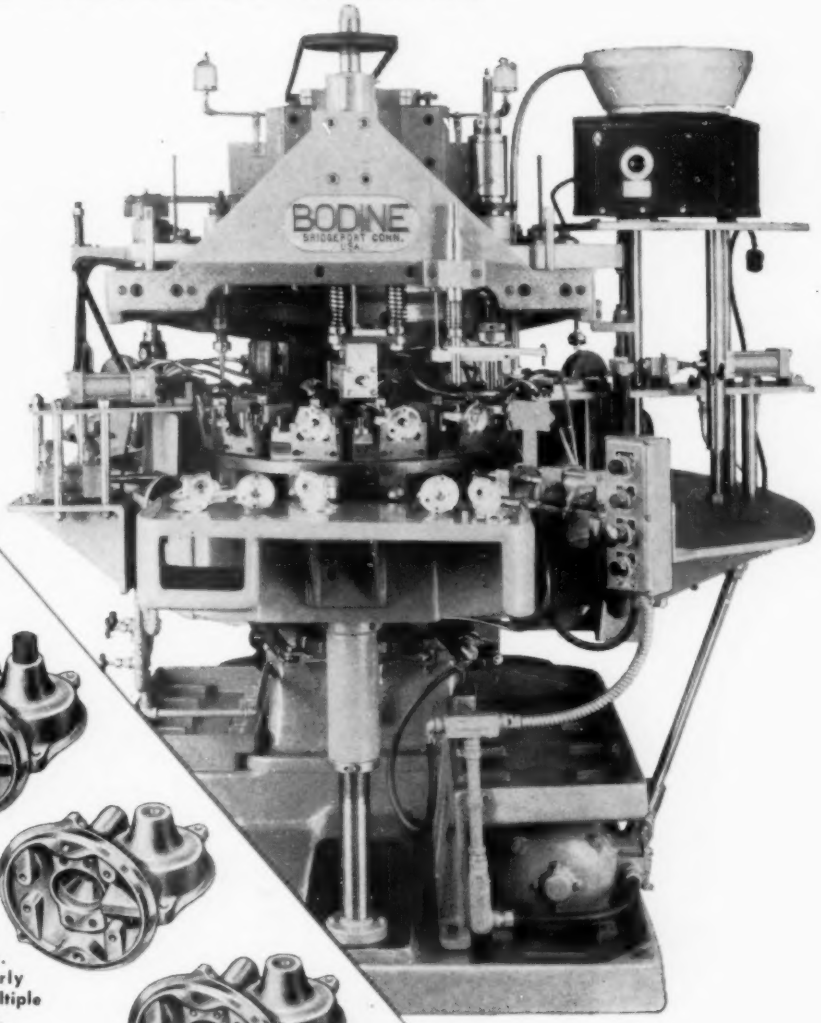
West Point Mfg. Co.
26939 W. SEVEN MILE RD.
DETROIT 19, MICHIGAN

USE READER SERVICE CARD; INDICATE A-4-290-3

Bodine CASE HISTORY NO. 37

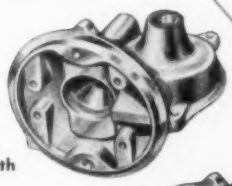


1 Hand-load part to clamping fixture.

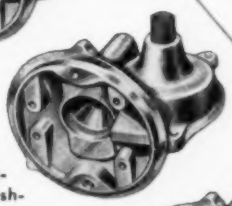
2 Automatically position locking lever.

3 Inspect for part and proper positioning in fixture.

4 Automatically clamp.



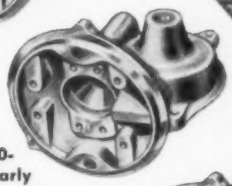
5 Spot face ⅝" dia. maintaining depth to ± .002".



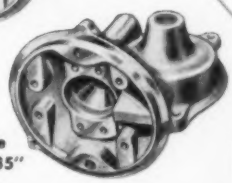
6 Automatically hopper feed, transfer and insert Oilite bushing.

PROCESSING WINDSHIELD WIPER MOTOR HOUSINGS

7 Drill 4 - #31 dia. (.120") holes and 1 - .1235" dia. hole (angularly mounted multiple drill head).



8 Tap 2 holes #10-32 with angularly mounted 2-spindle tap head.



9 Size I.D. of Oilite bushing to .3735" - .3745" dia.

10 Automatically unlock and retract locking lever.

11 Hand-unload.

PRODUCTION

One piece per stroke . . . 20 strokes per min. — 1000 pieces per 50-min. hour. 10,000 individual operations per 50-min. hour.

MATERIAL

S.A.E. #925 Die Casting (Parts No. EMG-2, EMG-3, right- and left-hand).

TOLERANCES

(Other than specified above) Drilled holes: Size .001". Location: ± .002". Tapped holes: Class 2 threads.

MACHINE

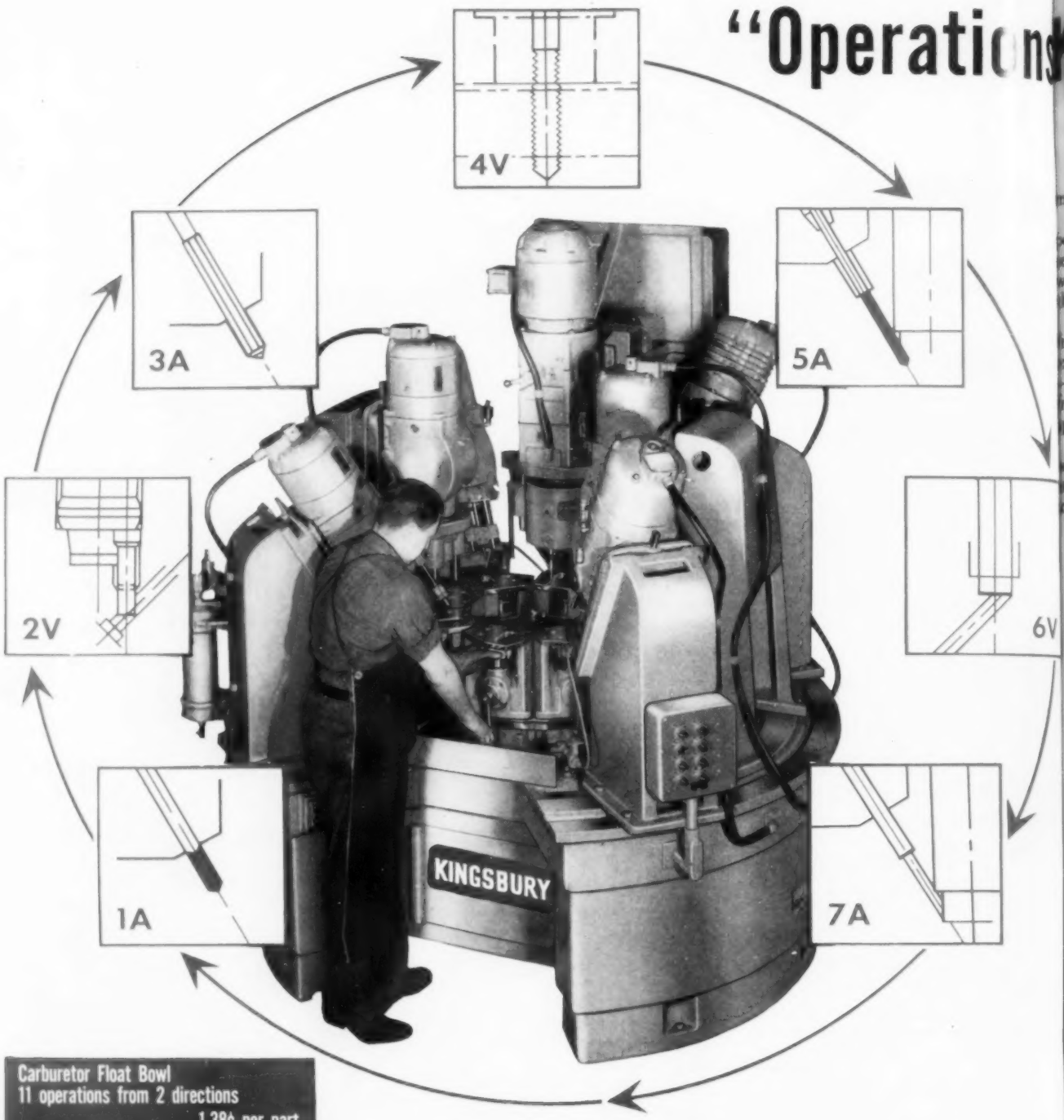
Bodine Model 42-30 Drilling, Tapping, Assembling Machine. Write us for Bodine Brochure TE-4 "12 Case Histories."

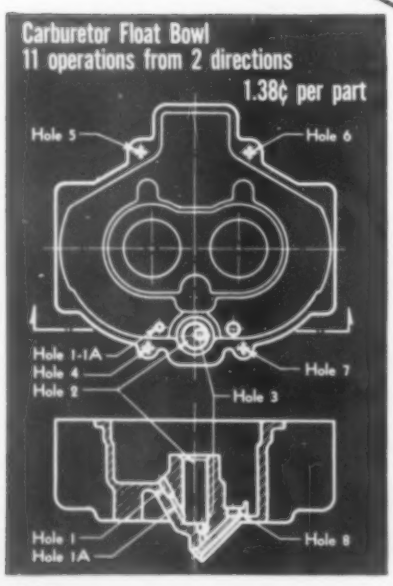
"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools."

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

"Operation





Watch this Kingsbury drill, ream

. . . at the rate of 55.9 operations every minute

It works on a Carburetor Float Bowl (zinc-alloy die casting) operating on 7 vertical and 2 angular holes. It produces 305 parts per hour gross, at a cost of 1.38c per part.

This Kingsbury machine was custom-built to do a high production — low cost job on this particular piece. Four angle (A) and three vertical (V) units, operating 10 spindles, are mounted on a 60 inch base. Eight work fixtures (one for unloading and loading) are mounted on a 30 inch index turret, which indexes through the seven work stations in approximately 44 seconds. During the cycle the machine performs 11 precision operations, including broaching

Let's follow through a work cycle — and remember this can go on day after day, year after year, producing accurate parts at low cost.

Kingsbury" all count up for profit

Let's look at these four machines

Combining operations makes it possible to perform more work in a given period of time.

On a Kingsbury Machine the tools at each station perform one or more of the required operations within a set time interval. The object is to perform all required work on the piece in one chucking within one cycle through the machine.

A single piece may be worked upon by different tools from several directions simultaneously. Everything except loading and unloading is controlled automatically — the machine takes over completely, carrying the work from station to station until the part is finished to specifications.

You save — because one machine does the work of several, with one operator, one chucking . . . and a high standard of accuracy that practically eliminates scrap cost. *You gain* through greater and more uniform output.

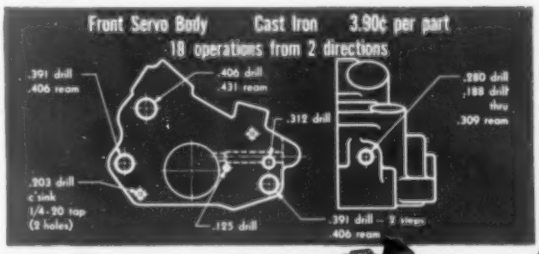
Kingsbury Machine Tool Corp.
104 Laurel Street, Keene, N. H.

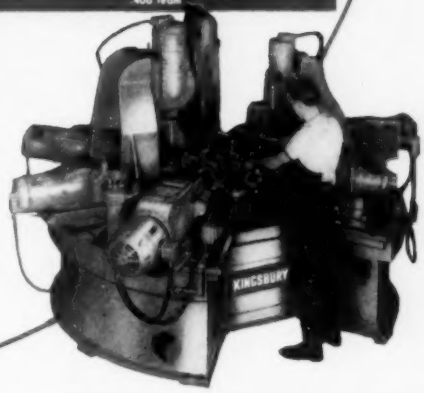
148.3 operations per minute

The machine drills, mills, end-mills, c'sinks and taps, at seven operational points. Seventeen tools function at six Kingsbury Units, mounted on a 60 inch base. The 30 inch index turret has eight work fixtures. Gross production 370 parts per hour.

51.0 operations per minute

The machine drills equally-spaced holes in a bolt circle slightly over 12 inches diameter. One vertical Kingsbury Unit with multiple spindle head operates 6 drills. The work fixture indexes five times to produce 30 holes — then moves to free the work for unloading and loading. Gross production 102 parts per hour.





63.3 operations per minute

The machine drills, reams, c'sinks and taps at eight operational points. Eighteen tools function at seven Kingsbury Units mounted on a 100 inch base. The 20 inch index turret has eight work fixtures. Gross production 211 parts per hour.

Seat, burnish, broach and tap

Unit 1A .136 drills Hole 1 at 60° angle, 7/8 inch deep.

Unit 2V operates on cored Holes 2 and 3. It has a combination burnishing and broaching tool attached to the quill of the drill head. Spindle is eliminated. Feed mechanism of drill head forces tool downward. .625 burnishes Hole 2 to a depth of inch and .125 broaches Hole 3 to a depth of 3/8 inch. Hole 3 is located .1875 off center line of Hole 2.

Unit 3A .1375 reams Hole 1.

Unit 4V has a four spindle auxiliary drill head; taps Holes 4, 5, 6, 7 (10-32 NF Taps).

Unit 5A .057 drills Hole 1-A at same 60° angle, 5/8 inch deep.

Unit 6V .250 burrs intersecting hole at bottom of Hole 8.

Unit 7V .136 burrs flat bottom seat in Hole 1.

One operator loads and unloads.

Each Unit Cost on the drawings includes the cost of the man and of the machine — no power or overhead. We assumed:

Unit cost of man equal to:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% eff.}}$$

Unit cost of machine to be:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% eff.}}$$

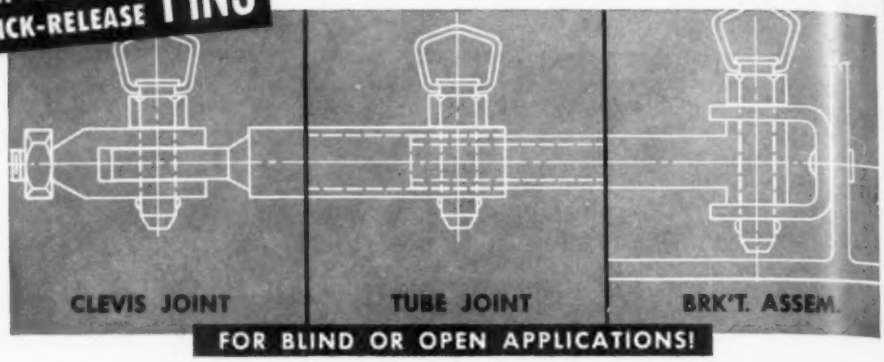
KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

pip
SELF-LOCKING QUICK-RELEASE PINS

FOR EVERY IMPORTANT LOCK-PIN PROBLEM

FIRST CHOICE OF LEADING ENGINEERS FOR SPEED — ECONOMY — RELIABILITY!



FOR BLIND OR OPEN APPLICATIONS!

There is a PIP pin for every purpose and requirement where *quick-release* and *positive self-locking* safety is specified. PIP pins operate on a patented push-to-insert, pull-to-remove principle which eliminates all need for nuts, bolts, cotter pins, other separate retaining items or assembly tools.

For increased speed of assembly, servicing, wider design acceptance and economy—specify PIP *self-locking, quick-release* pins. Available in most diameters and lengths to usual bolt standards or manufactured to your specifications. Illustrated details of PIP pins will be sent on request.

an accepted part in industrial, military and aircraft designs- **Write for complete details -TODAY!**

AVIATION DEVELOPMENTS, INC. PIP **210 NORTH FRONT STREET • BURBANK, CALIFORNIA**

AVIATION DEVELOPMENTS (CANADA), LTD. TORONTO • AVIATION DEVELOPMENTS, LTD., LONDON, ENGLAND

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-294-1

"M-B" JUNIOR
75,000 RPM *Pneumatic* GRINDER

4 TYPES—2 lengths of spindle extension; 2 types of air control valves, one for continual operation and one for intermittent work. Steel body for safety. No lubrication required. Abundance of power. Light-weight 12 ounces. Whole length 5-3/8", length of body 3". Accommodates mounted grinding wheels, rotary files, etc. on 1/8" dia. shanks. Speed such as to operate Tungsten Carbide burrs, rotary files, etc. to their full efficiency. "Remember, Built-in Quality Remains Long After First-Cost disappears."

Visit Our Booth No. 1439, A. S. T. E. Show, Philadelphia, April 26th to 30th.

Write for Literature

M-B PRODUCTS
46 Victor Ave.
DETROIT 3, MICHIGAN

USE READER SERVICE CARD; INDICATE A-4-294-2

PRECISION CIRCULAR CUTTERS

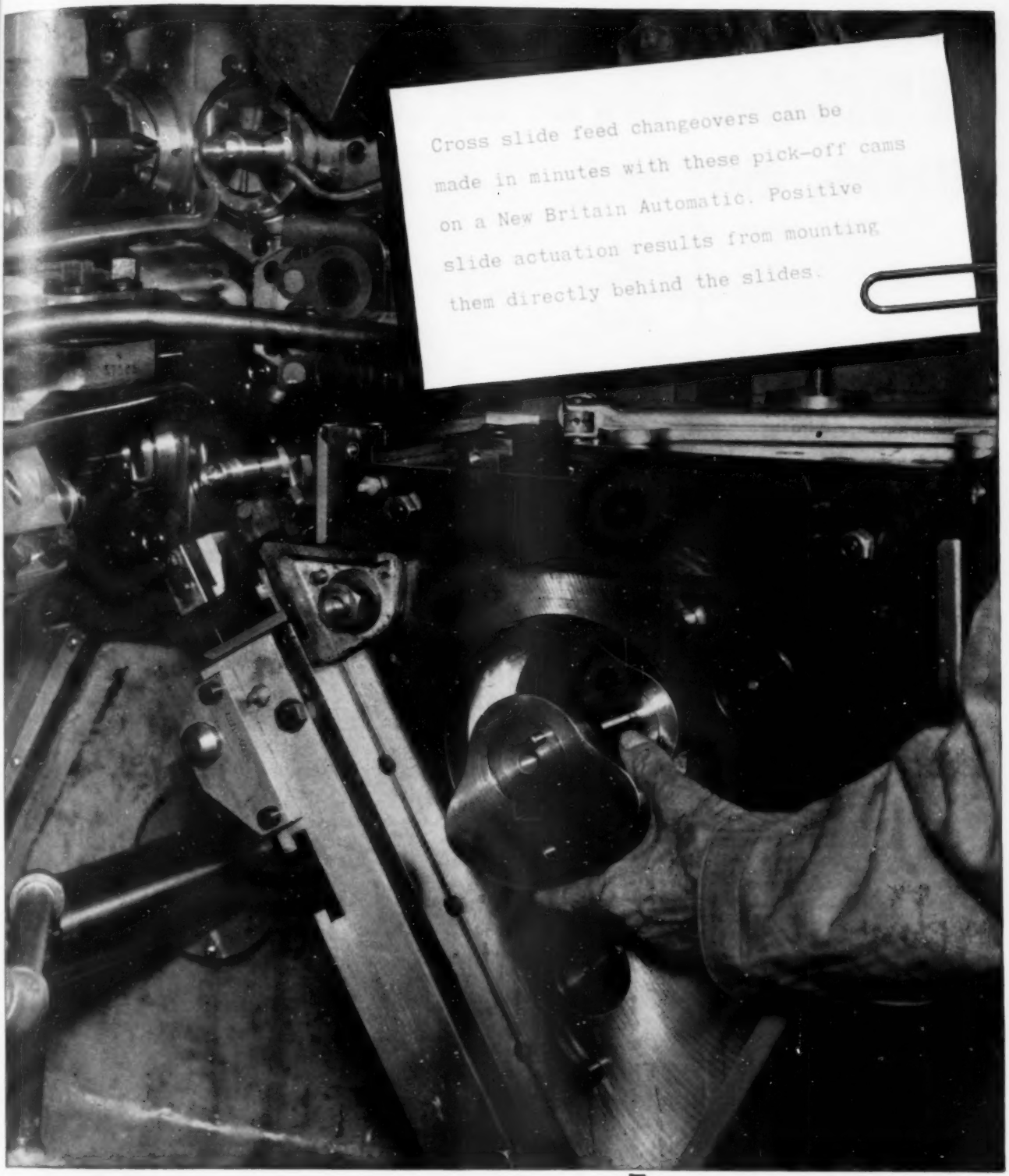
MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

USE READER SERVICE CARD; INDICATE A-4-294-3


Cross slide feed changeovers can be
made in minutes with these pick-off cams
on a New Britain Automatic. Positive
slide actuation results from mounting
them directly behind the slides.

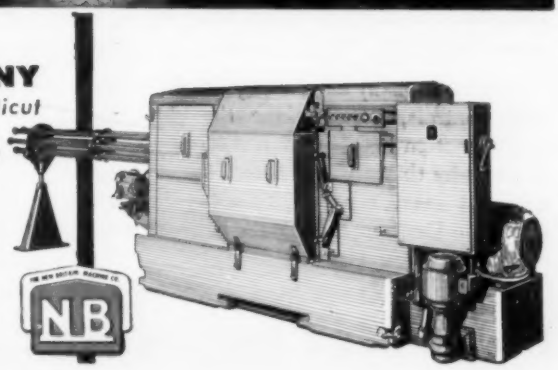
THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

NEW BRITAIN *Automatics*

Machines for Making Progress

Automatic Bar and Chucking Machines
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes

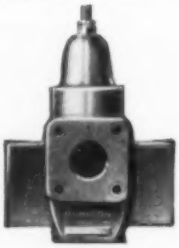


FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-295

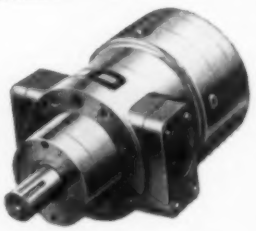
For lasting efficiency with less maintenance, specify

DENISON HydrOILic
PUMPS, MOTORS, CONTROLS
For circuit pressures to 5000 psi

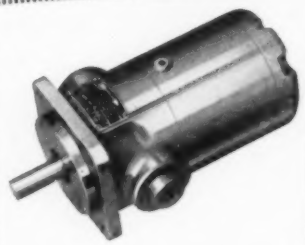
SURGE-DAMPING CONTROLS
Industrial and Aircraft Type
Eliminate Destructive Hydraulic Pressure Shock
¼" to 1" Sizes
For Pressures to 5000 psi
Catalog VS-1-A



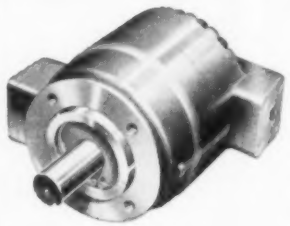
Direct-Operating PRESSURE CONTROLS
½" to 1½" Sizes
For Pressures to 2000 psi
Catalogs VRD-1 through VRD-8



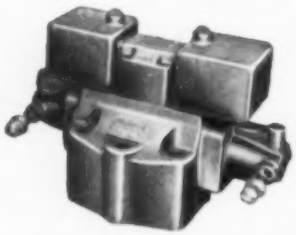
High-Pressure Axial-Piston PUMPS
Constant or Variable Volume
For 2500, 3000 and 5000 psi Circuit Needs
3.5 to 35 gpm Capacities
Catalogs P-4 through P-4-10



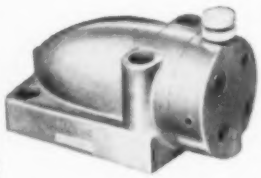
High-Torque Axial Piston FLUID MOTORS
Torque Ratings 13.8 to 112 inch-pounds per 100 psi (about 3 to 180 hp maximum)
For Pressures to 5000 psi
1500 to 3000 rpm
Catalogs FM-1, FM-2, FM-3-A



Dual-Purpose, Vane-Type PUMP/MOTOR
Ready for either pump or motor use without change
Shaft rotation in either direction
Four Sizes, 11 Models
Pumping Capacities: 3 to 82 gpm.
Motor Torque: 13 to 257 inch-pounds per 100 psi. Pressures to 2000 psi.
Bulletin P-5

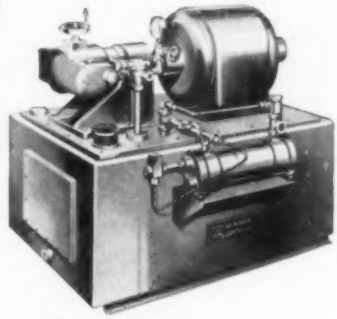


DIRECTIONAL CONTROLS
Manual, Mechanical, Electric or Pilot Control. ¼" to 2" Sizes
For Pressures to 5000 psi
Catalog VD-3



PRESSURE REDUCING VALVES
¾" to 1½" Sizes
20 gpm to 65 gpm Capacities
For Pressures to 5000 psi
Catalog VPR-1

Multi-Range FLOW CONTROLS
Full-Scale Regulation—Adjustable for Varying Input
¼" to ¾" Sizes
For Pressures to 3000 psi
Catalogs VFC-1, VFC-2



PUMPING UNITS
Constant and Variable Volume
46 Models—2 to 35 gpm Capacities
For Pressures to 5000 psi
Bulletins PU-3-A, PU-4 and PU-5

PROVED IN USE
under industry's toughest operating conditions

Denison HydrOILic Pumps, Motors and Controls are noted for their combination of high efficiency and rugged dependability.

In addition to fine performance under continuous, heavy-duty use, Denison HydrOILic Equipment offers space-saving design that simplifies circuit layout, makes installation easier, and minimizes maintenance problems.

Because so many users verify the extra value built into Denison Pumps, Motors and Controls, we continue the challenge made so often before—*let comparison prove to you* why they are first choice for so many needs of every type. Write today for full details on Denison HydrOILic Equipment to meet your requirements.

Pilot-Operated, Solenoid-Controlled DIRECTIONAL VALVES
Eliminate Spool-Sticking
¾" to 1½" Sizes, For Pressures to 5000 psi
Catalogs VD-1-1 to VD-4-2

Be Sure To See DENISON BOOTH #1400 at ASTE SHOW

DENISON HydrOILics
PUMPS | MOTORS | CONTROLS | PRESSES

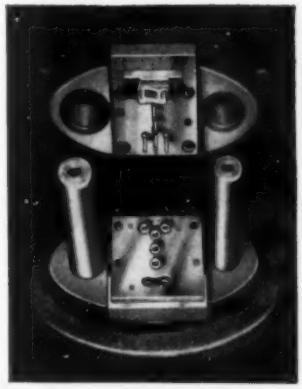
"The Finest Money Can Buy!"

The DENISON Engineering Company, 1191 Dublin Road, Columbus 16, Ohio

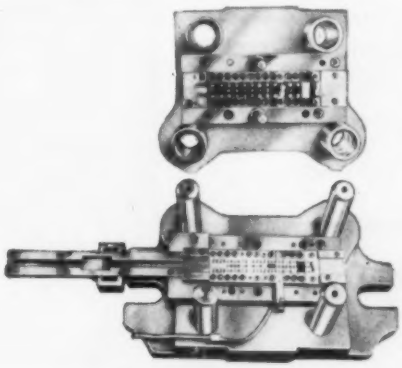
BENRUS OBTAINS "WATCHMAKER'S PRECISION" STAMPING with PRODUCTO *Catalog* DIE SETS

Economy, at no sacrifice of production speed or quality, is the keynote of this Producto case history, which shows how the Benrus Watch Co., Inc., Waterbury, Connecticut, cut their stamping costs in the production of wrist watch "X-type" expansion bracelets. The secret, according to Benrus, lay in converting a Producto 2-pin catalog die set into a 4-pin die set suitable for this precise link stamping job. The conversion, which was quickly and easily made, gave Benrus a small, compact, and carefully balanced die set that lined up properly and permitted a unilateral load and vertical punch, with no problem of "winking." As a result, Benrus has been able to maintain consistently high-quality, high-speed stamping with extremely low per-hour and per-grind costs. Rejects have been reduced to an absolute minimum. The specifications below tell the complete story.

PART: "X-type" Expansion Bracelet.
STAMPINGS: Top and bottom links (or liner parts) supporting outer shells.
MATERIALS — TOP LINK: Type 430 steel, dead soft, bright finish.
BOTTOM LINK: 85-15 rich low brass, dead soft.
TOLERANCE: Hole Locations — Both top and bottom ± .0005".
THICKNESS: Top — .018" Bottom — 030".
STATIONS: Top — 3. Bottom — 10.
PRODUCTION: Top — 6,000 pieces per hour. 50,000 pieces per grind.
Bottom — 6,000 pieces per hour. 75,000 pieces per grind.
OPERATIONS: Top — Pierce, pilot, blank.
Bottom — 6 draws, pierce, swedge, pilot, blank.



This special watchmaker die set, made by Producto to Benrus specifications, was used for stamping top links.



VISIT
BOOTH #722
ASTE INDUSTRIAL
1954 EXPOSITION
PHILADELPHIA
April 26-30 Incl.

For Precision Die Sets *Fast* Call...

THE PRODUCTO MACHINE CO. 930 Housatonic Ave., Bridgeport 1, Conn.
ALSO MAKERS OF TOOL AND DIEMAKERS ACCESSORIES, VISES, MACHINERY

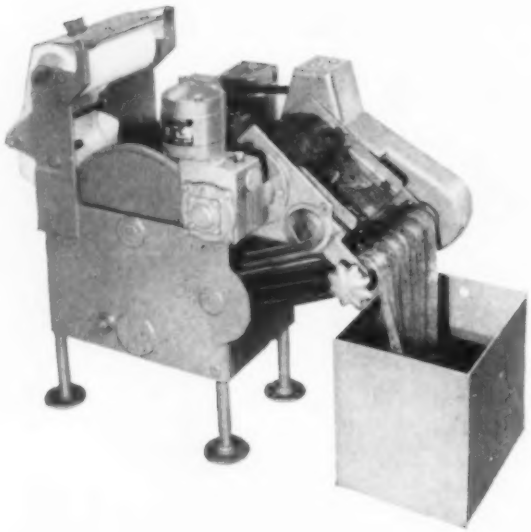
PRODUCTO

1PD84A

Remove BOTH

MAGNETIC
AND
NON-MAGNETIC
PARTICLES!
FROM METAL CUTTING FLUIDS

WITH



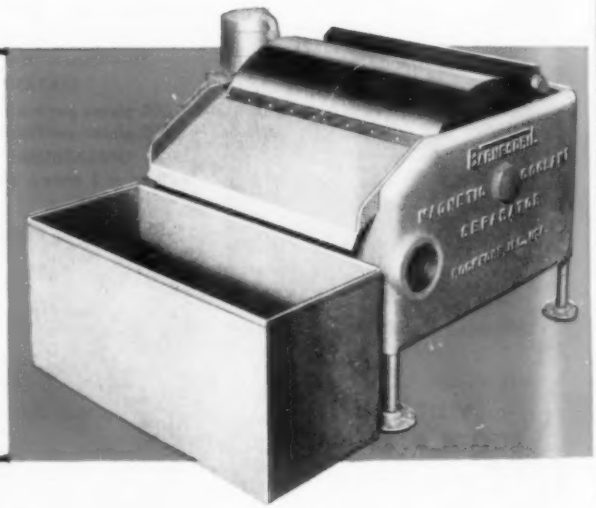
New
BARNESDRIL
KLEENAL MAGNETIC FILTER

- ★ Remove Metallic Sludge and Abrasives
- ★ Economical, Automatic Operation
- ★ Rapid, Double Cleaning Action

You can now obtain all the benefits of **BARNESDRIL** Automatic Magnetic Coolant Separation, *plus* the added efficiency of removing non-ferrous material. Ask your **BARNESDRIL** representative for complete data.

Cleaner Coolants

Efficient **BARNESDRIL** Automatic Magnetic Coolant Separators sharply reduce machine maintenance and downtime, increase finish quality, and prolong coolant life. New **BARNESDRIL** developments offer even greater improvements in coolant supply and chip disposal. Write for Bulletin B3005.



BOOTH 907 — A.S.T.E. INDUSTRIAL EXPOSITION

HOLE **BARNESDRIL** FINISHING

BARNES DRILL CO.

870 CHESTNUT STREET • ROCKFORD, ILLINOIS

Get Help on *Any* **PROBLEM RELATED TO HONED SURFACES**

WITH **BARNESDRIL** COMPLETE HONING SERVICE

ENGINEERING • TOOLS • MACHINES • ABRASIVES

BARNESDRIL

HONING TOOLS

- Use a variety of abrasive stones.
- Available for new machines or machines in the field.
- Serviced by special abrasive experts.
- Replacement stones for all types.

BARNESDRIL

AUTOMATIC BORE-TO-BORE SIZING

BARNESDRIL tool design and development has produced Automatic Bore-To-Bore sizing. The most accurate sizing method yet introduced. The entire sizing operation is now simplified and divorced from the effects of eccentric or uneven stone wear.

Write for bulletin "Complete Honing Service" sent free upon receipt of letterhead request.

BARNESDRIL

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BARNESDRIL Engineers have the distinction of first introducing the honing process as a mass production method with the first honing machine built in 1924. They have since developed honing techniques and equipment for both horizontal and vertical applications in finishing automotive and farm implement parts, hydraulic cylinders, gun barrels and recoil mechanisms. With this background of experience and development of a complete line of honing equipment **BARNESDRIL** Engineers assure you of consistent trouble free production in any phase of honing cylindrical surfaces.

BOOTH 907 — A.S.T.E. INDUSTRIAL EXPOSITION

ENGINEERING • TOOLS • MACHINES • ABRASIVES

Get in Touch with Your **BARNESDRIL** Representative Today. Ask Him for a Proposal on Your Honing Requirements. Or Write

HOLE **BARNESDRIL** FINISHING

BARNES DRILL CO.

870 CHESTNUT STREET • ROCKFORD, ILLINOIS

Meet the BIG 4 in Reinforced Wheels

BFR BD BN BF

Famous Norton team features strength, versatility and safety . . . plus the value-adding

"TOUCH of GOLD"

BFR Semi-Flexible Hub-Type. Cotton fabric and Nylon reinforcement. Most popular light snagging wheel Also useful for weld smoothing, blending contours, light finishing, removing scale, notching gates and risers, minor cut-off jobs, etc. Reaches hard-to-get-at places.

Here's a Norton wheel family that's closely related in a number of ways that add up to better grinding jobs for *you*. Each has strong, laminated construction that provides much more than the usual margin of safety. Each is designed to cover a wide range of everyday grinding jobs. And each is engineered to give you fast, trouble-free, economical grinding — the true "Touch of Gold" — every time you put it to work.

The "Big 4" make up a well-balanced team, consisting of two sturdy hub-type wheels (BD rigid and BFR semi-flexible); one straight wheel (BF semi-flexible); and one cut-off wheel (BN). All are resinoid bonded.

The accompanying action shots can only hint at the "Big 4's" practically unlimited usefulness. Why not find out just how much time and money they can save you in your own grinding applications?

Ask Your Norton Distributor

to demonstrate Norton Reinforced Wheels in your shop. He knows the types and sizes of wheels you need, will be glad to help you in any grinding problems, and will call in a Norton Abrasive Engineer, if necessary. Or write to NORTON COMPANY, Worcester 6, Mass. for the Brand New Catalog on Reinforced Wheels. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. W-1547

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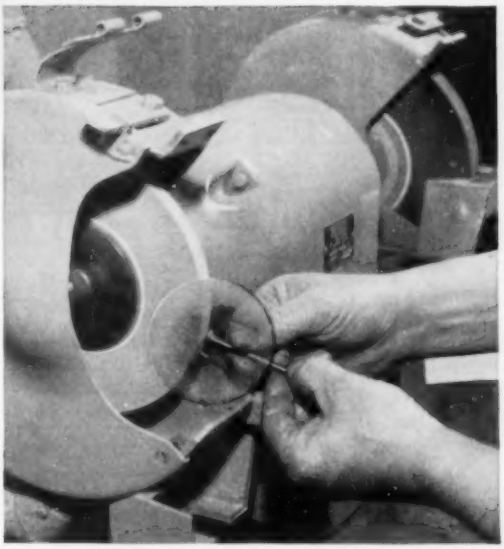
ABRASIVES

Making better products . . . to make other products better

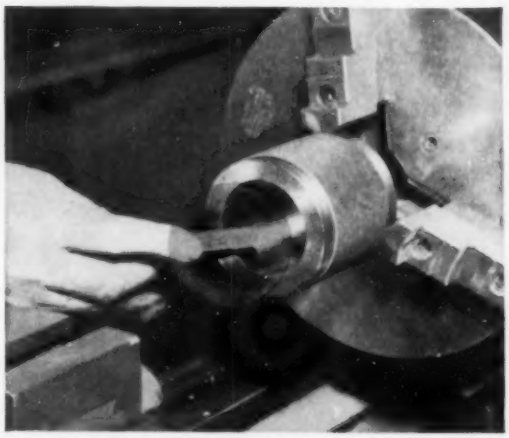
BD Rigid Hub-Type. Glass cloth and Nylon reinforcement. For heavier stock removal, smoothing flame-cut edges, slotting, notching, cutting-off and many other jobs where finish is less essential. Bridges the gap between the BFR wheel and the conventional cup wheel for portable grinding.

BN Cut-Off. Glass cloth reinforcement. One of the safest, longest-lasting cut-off wheels in industry. For cutting-off gates and risers from non-ferrous castings, cutting wire rope, cutting many non-metallic materials, notching, slotting railway track welds, etc.



BF Semi-Flexible. A straight wheel with cotton fabric construction. Ideal for deburring jobs, including stampings too large for tumbling. Also for blending and smoothing light welds and curved surfaces, removing flash from plastics, etc. For grinding on periphery only.

BF Mounted Wheels and Points. Same laminated construction as BF wheels. Like all Norton mounted wheels and points they're trued on their own spindles. Available in a wide variety of sizes and shapes for polishing die cavities, chamfering, Brinnell spotting, etc.



BF Hand Sticks. Laminated construction, as in BF wheels and mounted wheels and points. These convenient sticks provide an easy method of final hand polishing in places where wheels and buffing devices can't reach.

DO MORE...

DO IT BETTER

DO IT FASTER

ERRINGTON

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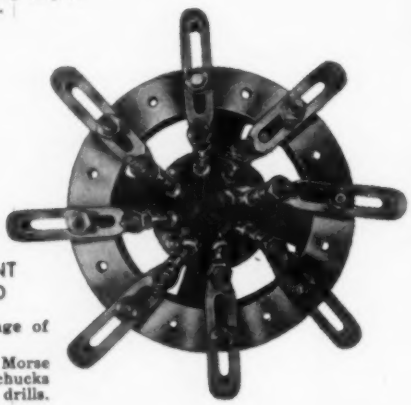
UNIVERSAL JOINT TAPPING HEAD

#0—0" to ¼" Tap Capacity 4 Spindles.

#1—7/32" to ⅛" Tap Capacity 4 Spindles.

Another pair of hi-speed production tools from Errington — Universal Joint Drilling and Tapping Heads. These dependable tools are adjustable to any pattern of holes . . . are available with 4 to 12 spindles. Heads made of the best grade sand Cast Aluminum with hardened and ground gears and spindles (made in one piece). Full grooved ball thrust bearings at all thrust points and Oilite bronze radial bearings. Remember to do more . . . better . . . faster . . . rely on Errington Hi-Speed Production Tools.



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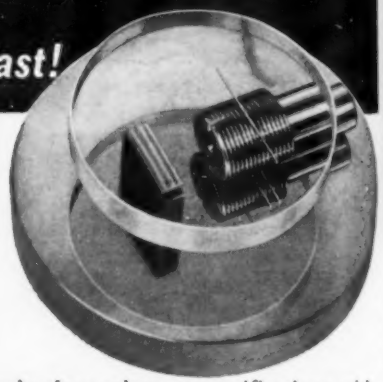

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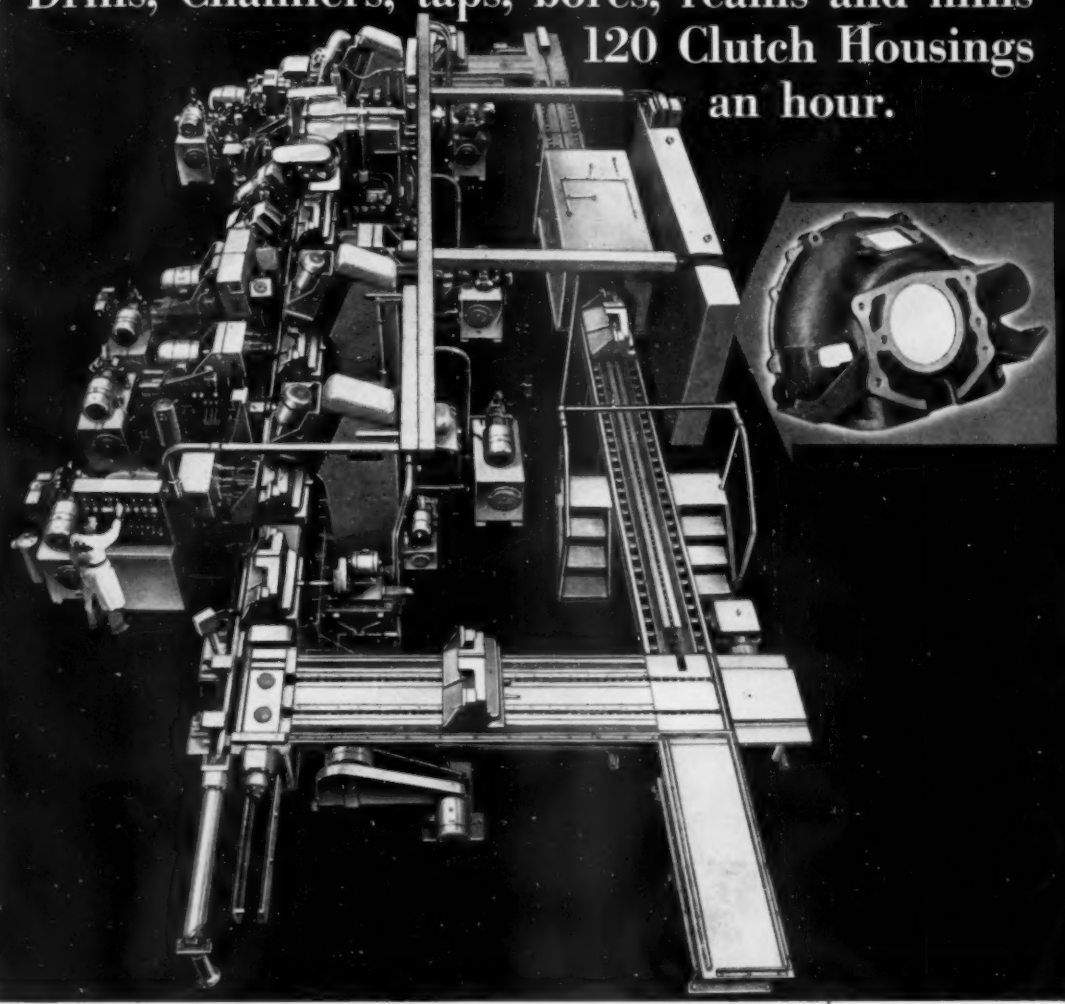

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- ★ Hardened and ground tool-steel ways.

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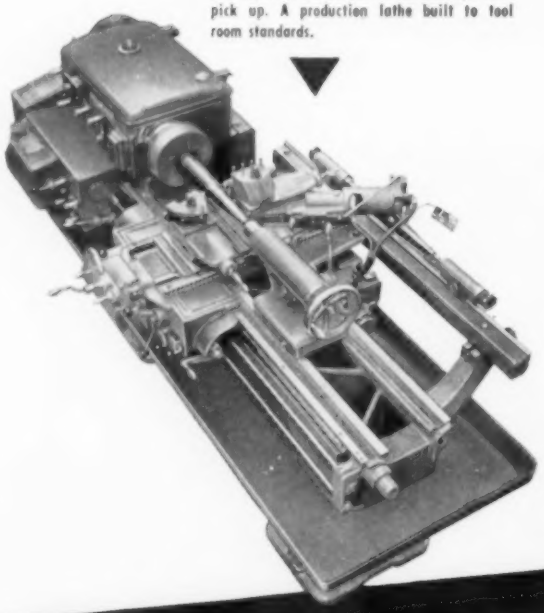
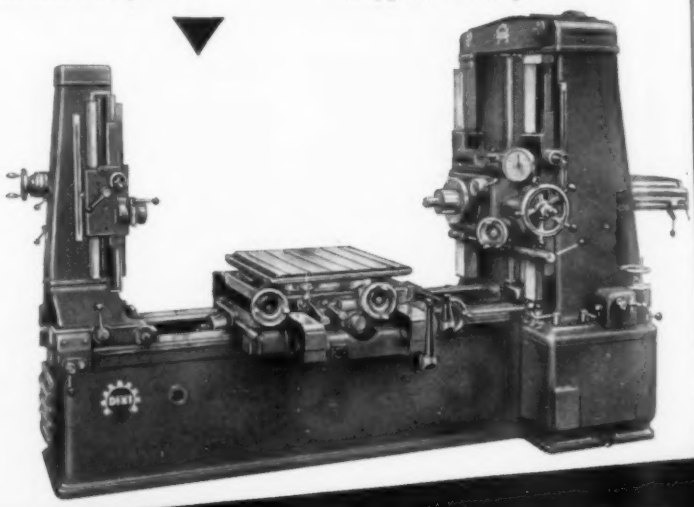


DIXI 60 COMBINATION HORIZONTAL BORING MILL AND JIG BORER WITH FIVE OPTICAL MICROSCOPES. Headstock, column, table settings accomplished by optical microscopes to insure overall accuracy of ± .0001". Built in rotary table also equipped with optical microscope for accurate angular settings. Table size 28¾" x 32⅝" Maximum distance table to spindle 19.7". Table travel—Longitudinal 23⅝"—Transverse 22¾". Hydraulic feeds for all functions 0– 78" per min. #40MM Taper spindle. Spindle travel 24.4". Spindle speeds 32-1350 R.P.M. Spindle feeds .0015"-.010" per rev.

New accessory precision circular dividing table considerably extends the range and advantages of the Dixi 60 by combining on one machine all the advantages of a horizontal boring mill with jig borer accuracy.



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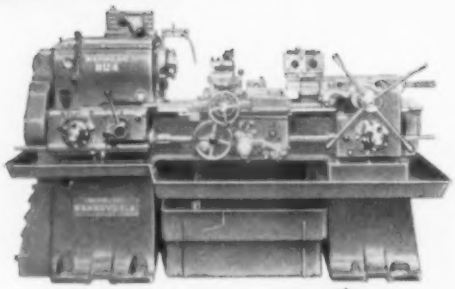

MAXNOVO MODEL RU 4 UNIVERSAL TURRET LATHE. Swing over bed 16-9/16". Swing over cross slide 9⅞". Capacity through spindle 2". Maximum distance spindle nose of face of turret 29½". Spindle speeds 64-1200 R.P.M. 8 power feeds to carriage .002"-.024" per rev. and 32 power feeds to turret .0005", .048". 8 or 12 H.P. motor drive. Machine can be furnished with air chuck, collet chuck, or bar feed attachment. The hexagon turret faces are machined and tapped to American standards and will accept standard turret tools of leading American manufacturers of this type of machine.

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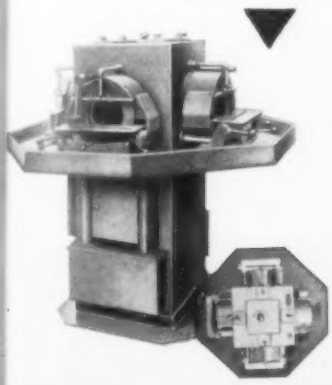
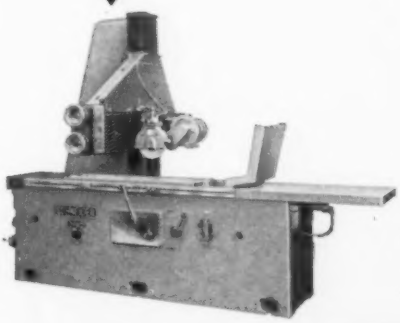
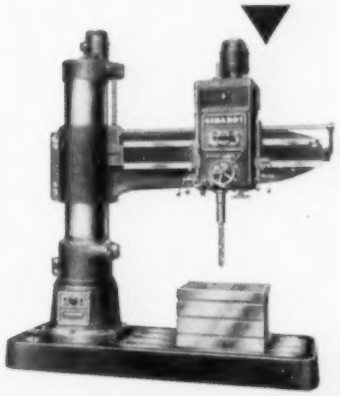


SCHNEIDER HYDRAULIC UNIVERSAL HORIZONTAL SURFACE GRINDING MACHINE TYPE JoH. Grinding spindle adjustable through any angle from 0° to 90°. MODEL JoH1, 24" x 10" Table, 18" Under Wheel. MODEL JoH2, 48" x 16" Table, 22" Under Wheel. MODEL JoH3, 60" x 20" Table, 22" Under Wheel. Table feed infinitely variable 0-60 ft. per min. Traverse feed infinitely variable 0-.600".



GIRARDS RADIAL DRILLS. Seven Sizes from 3' arm x 11¾" column to 10' arm x 25½" column. 3' and 4' arm machines have 12 spindle speeds from 32-1400 R.P.M. and 6 feeds from .0015" to .040" with #4MT Spindles. Larger machines have 21 spindle speeds from 14-1400 R.P.M. and 12 feeds from .0008" to .080" with #5MT Spindle and 7.5 H.P. Spindle Motor.



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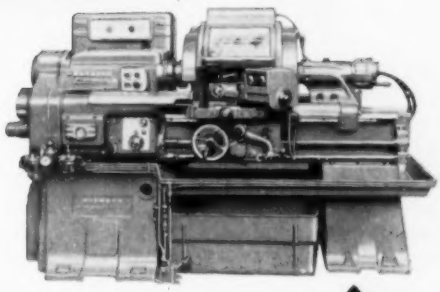

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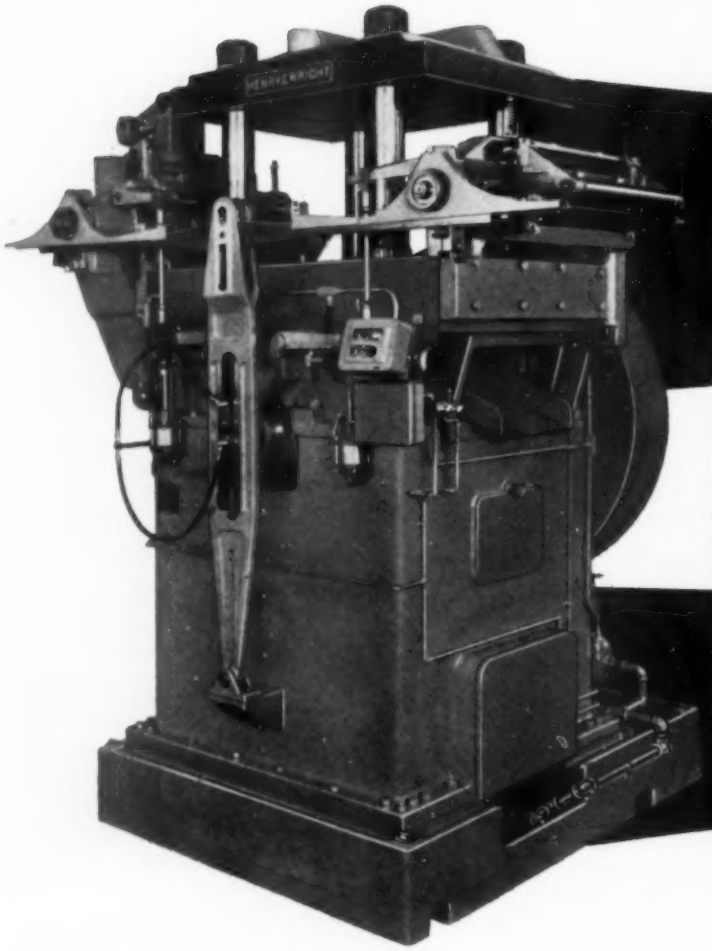

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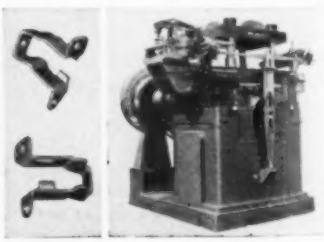

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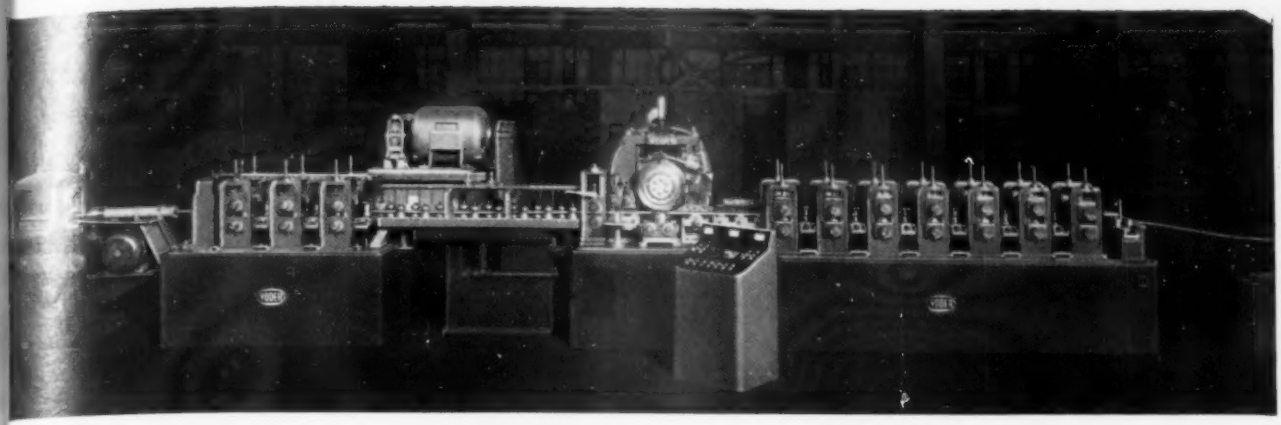

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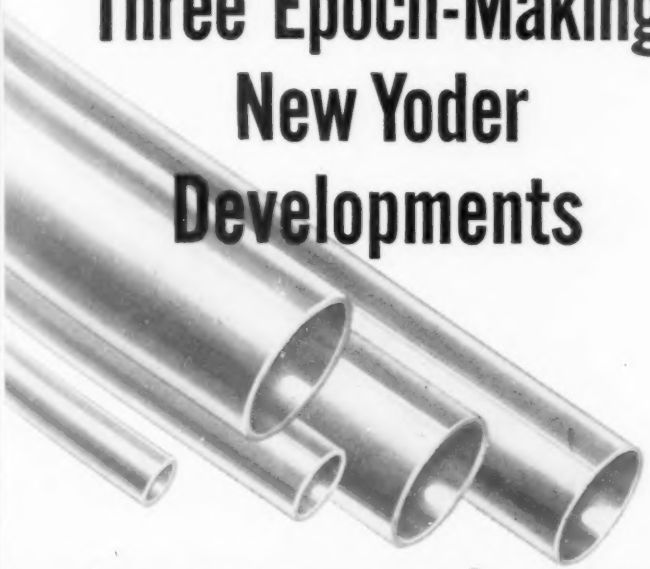

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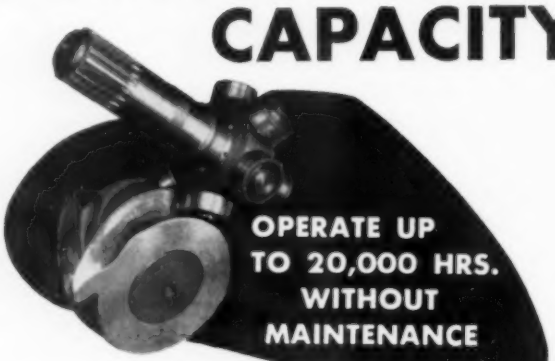

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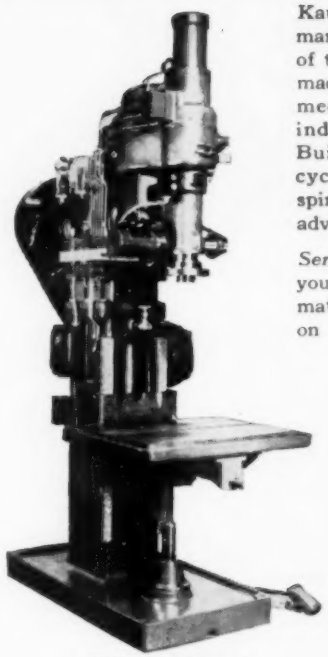

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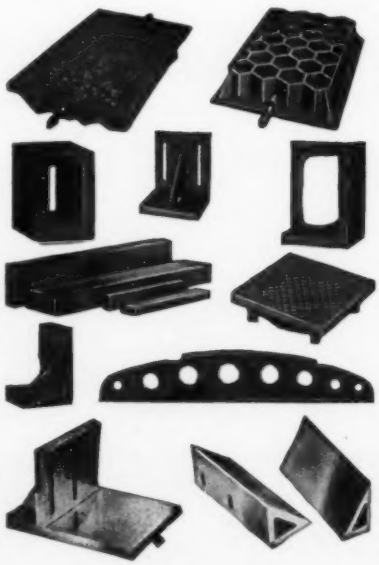

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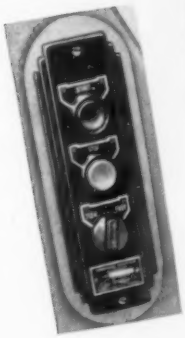
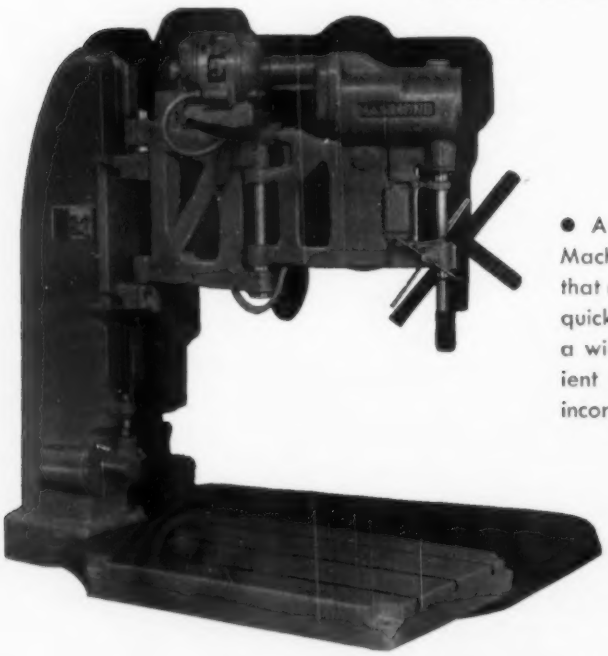
for *increased*
production

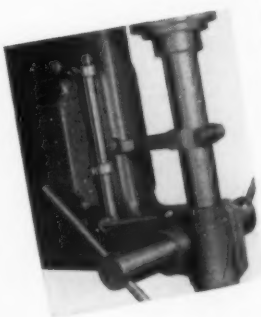


● Here is a machine designed to perform light drilling and tapping operations at high speed with minimum of effort. Any one of six spindle speeds may be quickly selected and tapping is always instantly available without any adjustments to the machine. It makes an excellent choice for miscellaneous work on a large layout of varying size holes.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio
Detroit Office: General Motors Building



● A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.



engineered for production

FOOTBURT

MACHINE TOOLS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-312

More dollars profit for you when you use SPEED-WET® METALITE® Fibre Discs

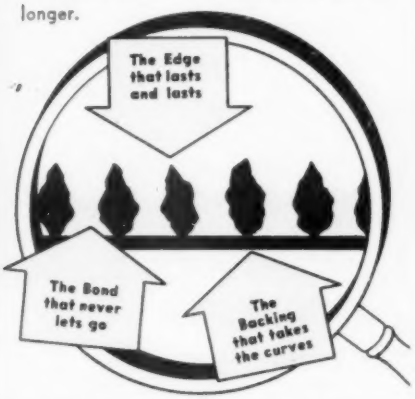
For the reasons given at the left, SPEED-WET METALITE Fibre Discs are the fastest-cutting, longest-lasting Discs you can get. The time they save on every job and the extra grinding mileage you get from every disc, increase your profit margin by the amount they cut your grinding costs.

Until you actually use SPEED-WET METALITE Fibre Discs you just can't appreciate how much faster and cleaner you can grind with these sharp-cutting discs. The quick way to find out is a FREE trial right in your own plant. Just write and let us know when and where. Address Behr-Manning, Troy, N. Y., Dept. TE-4.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

THE HARD COLD FACTS

Here are the 3 main reasons why SPEED-WET METALITE Discs cut cleaner, faster, longer.



1. THE ABRASIVE is harder and sharper. It's Aluminum Oxide — a real NORTON grinding wheel grit, almost diamond-hard that holds its cutting edge far longer than ordinary grits.

2. THE BOND is immune to heat. It's a Thermo-setting, non-softening resin bond, made doubly strong by the exclusive BEHR-MANNING® DURABONDED® process that anchors the grains securely.

3. THE BACKING is all-fibre that combines enough flexibility to grind curves with enough stiffness to assure plenty of cutting action.

GET THESE HELPFUL POINTERS ON DISC GRINDING

This folder points out the common faults in disc grinding and tells how to use a disc grinder correctly to avoid them. A copy will be mailed to you on request. Ask for the December 1953 *Barneygram*.

G-2

BEHR-MANNING® CORPORATION
division of NORTON Company

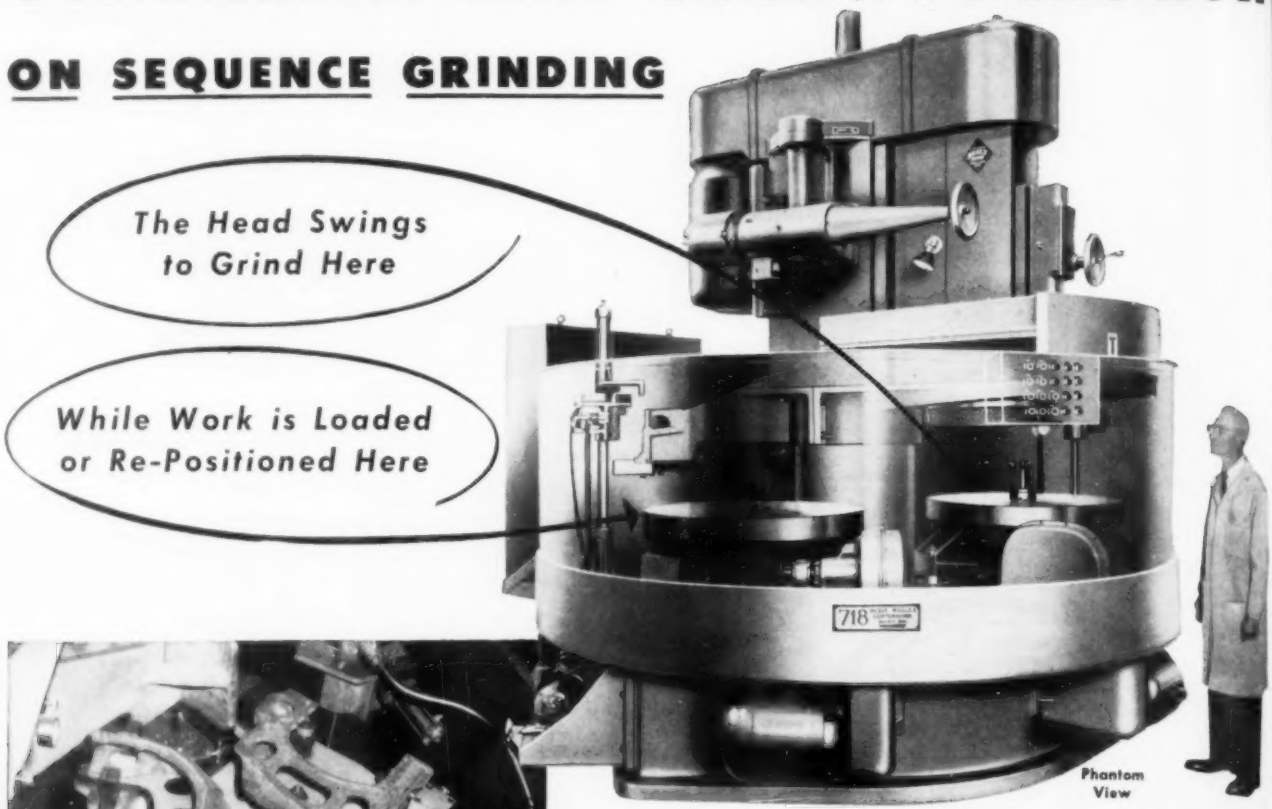
▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

For the newest in coated abrasives..watch BEHR MANNING!

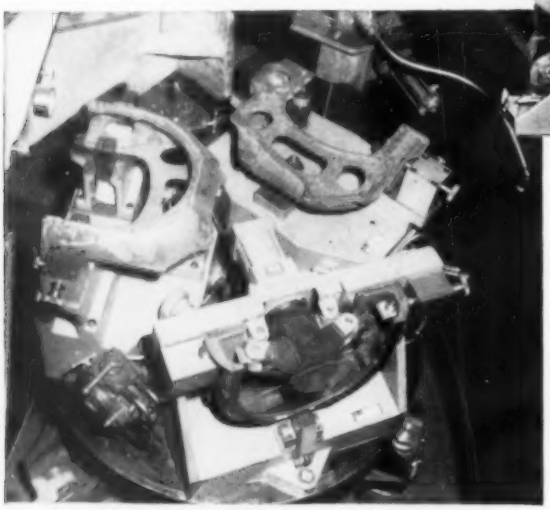
A NEW KIND OF GRINDER THAT GIVES

Continuous Low Cost Production

ON SEQUENCE GRINDING



Phantom View



One Fly Wheel Housing—Ground on *Three* Surfaces—Every 72 Seconds!

This high production rate is achieved grinding large automotive housings. An automatically controlled grinding cycle completely frees the single operator for loading, re-positioning and unloading duties. Accuracy is also noteworthy. With approximately 3/32-in. of stock removed from each of three faces, work is held parallel within .003-in., flat within .005-in. and to size within .010-in.

Only the BESLY-BOWEN RADIAL HEAD FACE GRINDER

Has These Cost-Cutting Features:

- **Multi-station Fixturing Permits Continuous Grinding of Sequence Operations—No Interference Between Loading and Grinding**
- **Automatic Grinding Cycle**
- **Automatic Size Control**
- **Fixturing Flexibility—Each Rotating Station May Hold Several Fixtures, Depending on Number of Faces to be Ground**
- **Single, Massive Slow-Moving Bearing Insures Accuracy with Four-Way Compound Movement . . . Up—Down—Back and Forth**
- **A Wet Grinding System—Free from Flying Water and Spray**

Available in four models from 5-100 H.P.

Write for a Full Description of This Type of Grinder and Bulletin 700

BESLY GRINDERS AND ACCESSORIES
BESLY TAPS, DRILLS, REAMERS, END MILLS
BESLY-TITAN ABRASIVE WHEELS
BESLY TOOL BITS

BESLY

BESLY-WELLES
CORPORATION
Established as CHARLES H. BESLY AND COMPANY in 1875
118 Dearborn Avenue, Beloit, Wisconsin

Vanadium-Alloys

announces

a new **FM** series

FREE MACHINING

of free-machining steels*

in the following important tool steel grades

HIGH SPEED STEELS

RED CUT SUPERIOR FM
VASCO SUPREME FM
NEATRO FM
VASCO M2 FM
8N2 FM
VAN-LOM FM

DIE STEELS

OHIO DIE FM
(air hardening, high carbon, high chromium)
CROCAR FM
(oil or air hardening, high carbon, high chromium)
SPEED CUT
(free machining die steel, produced since 1947)

For tool steel applications where *free machining* quality is desirable, we offer this new FM Series. Vanadium-Alloys FM steels machine more easily, permit better machined finish, and in certain instances show improved performance. To obtain free machining characteristics in the nationally-known steels listed above, simply specify the brand name desired, followed by the letters FM.

Complete information on our FM steels is available from your Vanadium-Alloys representative. Ask him for the facts.

*Several grades manufactured under U.S. Patent No. 2,204,283, Simonds Saw and Steel Co.

Vanadium-Alloys

STEEL COMPANY
LATROBE, PA.

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

KELLER TOOLS "button up"

461 assemblies an hour

all day long!

Two workers make a team in assembling parts for automobile horns. Above, the screws are started which attach assemblies of stacked parts to the horn yoke. At left, the two screws are run down and tightened. Both workers use Keller Pneumatic Screw Drivers, and together they assemble at the rate of 461 units per hour.

Sustained high production rates result from providing workers with easy-to-handle Keller Air Tools engineered to the job. Waste motions are eliminated, fatigue is reduced, and production speeds are maintained hour after hour.

Keller application engineers, located in principal cities from coast to coast, have the training, know-how, and experience to select the correct tool for the job. They have a much wider selection of attachments, fittings, pickups, and finders from which to choose . . . plus the backing of design engineers ready and able to provide special adaptations or special tools if needed.

Have you talked to the Keller man, lately?

These are a few of the many Keller Screw Drivers:

KELLER
Pneumatic Tools
KELLER TOOL CO.

1311 Fulton Street
Grand Haven, Michigan

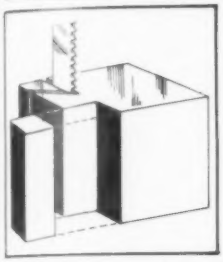
EXTRA DoALL PRODUCTION NEWS

SEE DEMONSTRATIONS
New Machines & Tools
during ASTE Ind. Exposition
April 26-30, Philadelphia
DoALL Exhibit 1503

Vol. Published by the DoALL Company, 254 N. Laurel Ave., Des Plaines, Illinois No. 1

New Manufacturing Method!

Typical Applications

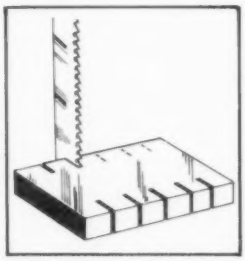


Notching

—a job best done on a band machine. Metal is quickly removed as a single piece.

Slotting

—done automatically with power feed table moving work into the thin steel blade.

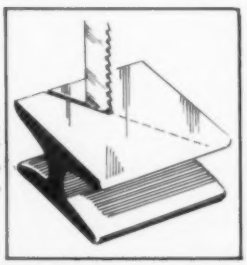


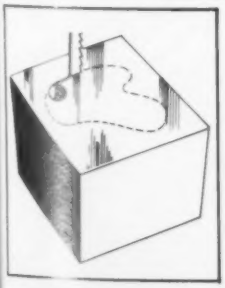
Splitting

—what machine could slice metal faster, neater and with less waste than a band machine?

Angular Cutting

—the work can be clamped in any position, the table tilted for compound angles.





Radius Cutting

—a band machine cuts any shape, internal or external.

Reduces Capital Investment, Requires Less Labor and Time for Machining Operations

With the development of the completely new line of machines and the remarkable new cutting tool described on the following pages, The DoALL Company has provided industry with the means for applying entirely new and better methods of performing production line and tool-room machining operations. They require less capital investment to accomplish given jobs. They work faster, use fewer labor hours. They save material. They will handle new difficult-machining alloys.

In these new tools is a positive answer to the ever-asked question "is there a better method?" The new machines are the first line of 16", 26", 36" and 60" contour bandsawing machines ever equipped with power feed tables to carry the work into the cutting tool, enabling them to do automatic production line work. All sizes have recirculating coolant systems to extend tool life and increase cutting rate. They are especially designed to provide greater accuracy than ever before and faster, easier operation from centralized control panels.

New Tool Outperforms Anything Previous

The machines are especially designed to provide the power and rigidity necessary to take advantage of the most remarkable development ever made in band tools—the new DoALL Demon High-Speed Steel Saw Bands. Long sought, long awaited, these new blades are now a proven reality. Technological developments in metallurgy have made it possible to produce high speed steel in strip form for saw bands. DoALL research and investment have developed the manufacturing, heat treating and welding methods necessary to provide a safe, flexible, high speed steel saw band.

Users can now realize faster cutting rates, longer blade life, greater accuracy and versatility that will enable them not only to greatly reduce present band machining costs, but to more profitably utilize band machining in place of other machining methods.

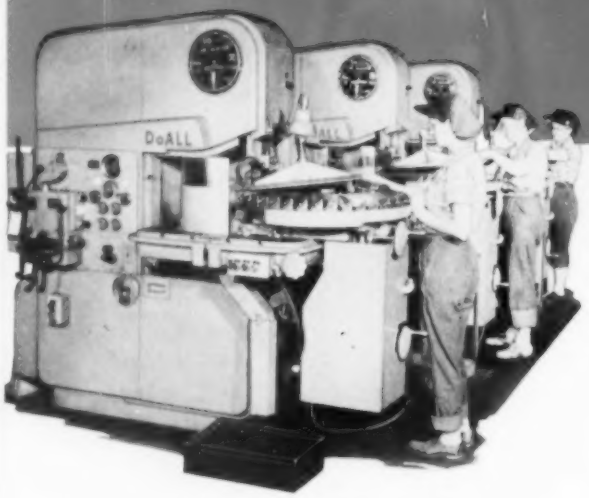
Check List of Advantages

- Cutting tool cuts continuously
- Work clamped to table and hydraulically fed into tool.
- Stock is removed in sections, often usable, instead of being reduced to chips.
- Fixturing and clamping simplified because force of tool is toward table.
- No distortion of part being machined.
- Same machine can cut, file finish, grind and polish.
- Machine is vertical . . . requires minimum floor space
- Low capital investment
- Cuts all materials

———See Next Page——→

COMPLETELY NEW
TO INCREASE YOUR P

Opens a New era in



1 NEW DoALL POWER-MATIC BAND MACHINES 2

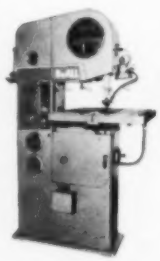
16", 26", 36" and 60" models • More power • Hydraulic feed tables • Improved, more rigid frames • Wider speed ranges • New tool coolant systems • Easier push button operation • New centralized controls • New job selector

NOW YOU can cut any shape in any material faster, at lower cost and with less manual effort than ever before. New DoALL Band Machines will not only outperform all other band machines when using carbon steel saw bands, *but they are the only contour-cutting machines in the world specially engineered to handle the new high-speed steel blades!*

Only DoALL offers the speed ranges, the hydraulic feeds, the heavier frames, the greater power, the air and coolant systems, the range of models to take greatest advantage of high speed steel saw bands for production or tool-room machining.

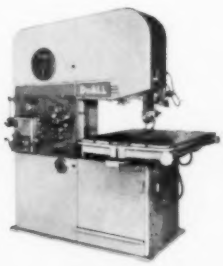
Machines and blades—the two go together. You have to see them work to believe their performance. Ask for a free demonstration. Just call your local DoALL store.

A Size and Model for Every Purpose

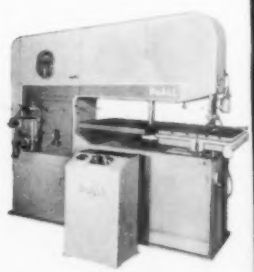


Model 16-3
16" Throat

Model 36-3
36" Throat



Model 26-3
26" Throat



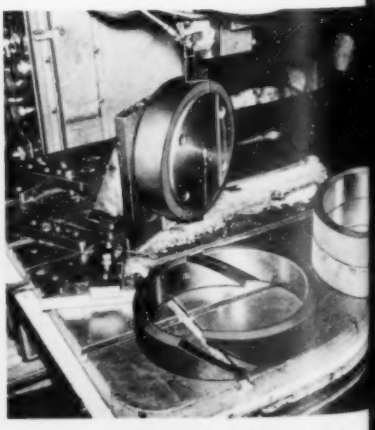
Model 60-3
60" Throat

To Cut Costs...

Do it on the DoALL!

Call DoALL — Pioneer in the development of Better Band Machine equipment.

Automatic trimming of rotor blades in jet turbine wheels—an amazingly fast friction sawing operation on the new production band machines. Power-driven fixture.



Angular splitting of bearings. Bearing slips over mandrel—power feed moves piece into blade. Loading time—negligible! Production—phenomenal!

MACHINING TEAM
PRODUCTION PROFIT!
in Band Machining

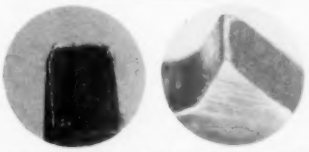
2 NEW DoALL DEMON HIGH-SPEED STEEL BLADES

NEW DoALL Demon* Saw Bands *made from high-speed steel* provide amazing performance from the band machine in cutting material . . . just as the newer types of cutting tools did for milling, turning, drilling and other types of machining. Permits higher speeds . . . heavier feeds . . . greater tool life and ability to handle hard-to-machine materials!

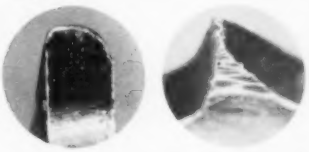
The successful development of these safe, long lasting new bands has opened entirely new opportunities for reducing costs and for utilizing the band machining method more widely.

So great is the cutting ability of DoALL *Demon High-Speed Steel* blades that only the new DoALL machines can actually take fullest advantage of them.

DEMON VS. CARBON STEEL



Above—Demon Blade after 10 cuts in hardened steel—still going strong. It lasted 98 cuts. (30x photomicrograph).



Above—carbon steel blade after 10 cuts in hardened steel—worn out. (30x photomicrograph).

SPECIFICATIONS

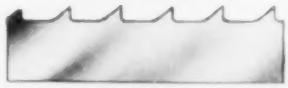
DoALL DEMON HIGH-SPEED STEEL SAW BAND							
TYPE		Buttress Raker Set			Precision Raker Set		
Width in Inches	Gauge in Inches	Pitch 2	Pitch 3	Pitch 4	Pitch 6	Pitch 8	Pitch 10
		Nominal Set and Code					
¼	.025						.044 VFMR
⅜	.025						.044 YFMR
½	.025			.043 QZMR			.044 QFMR
¾	.032		.056 HCMR		.055 HDMR	.055 HDMR	.055 HFMR
1	.035	.065 LBMR	.061 LCMR		.058 LDMR	.058 LEMR	.058 LFMR

*Reg. trade mark and patents applied for.

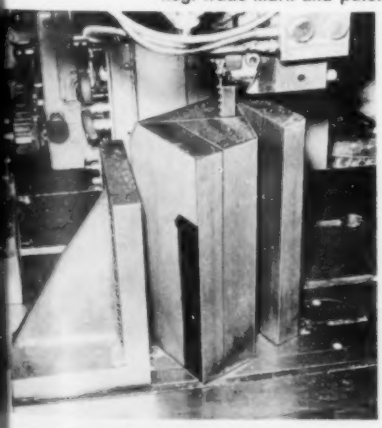
Red heat hardness—teeth stay hard at temperatures up to 1100°F . . . provide for greater blade life and up to 10 times greater cutting rate • Takes heavier feeds at higher tool speeds • Cuts harder and tougher materials • Does more work in less time!

AVAILABLE IN 2 tooth styles . . . 5 widths . . . 6 pitches. All welded to fit the new line of DoALL Power-Matic and other Band Machines.

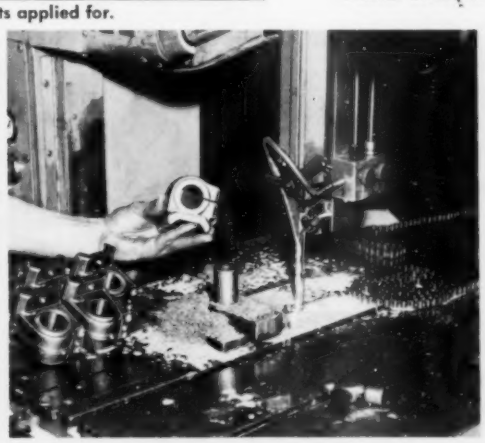
Demon Precision



Demon Buttress



Notching 12" thick tool steel. Fixturing—virtually non-existent! Only simple back-up bar is used. Unwanted material is removed in whole salvageable sections.



Precision slotting of tool holders done faster on band machine because: (1) hold-downs not needed; (2) continuous cutting removes material faster!

Internal Radius Cutting on rings of soft, magnetic iron. At completion of cutting, inner ring is removed in one usable section with magnetic qualities intact.

New Performance For Friction and High Speed Sawing

A new line of DoALL Zephyr band machines for high-speed sawing of metals and wood and for friction sawing of ferrous metals has been designed to give improved all around performance and to handle the new DoALL friction and Claw-Tooth (positive rake angle) saw bands. Frames are more rigid, controls are centralized for easy operation and new standard variable speed ranges are provided. Special speed ranges and extra work heights are available where practical.

The illustrations at the right show the new models.

•

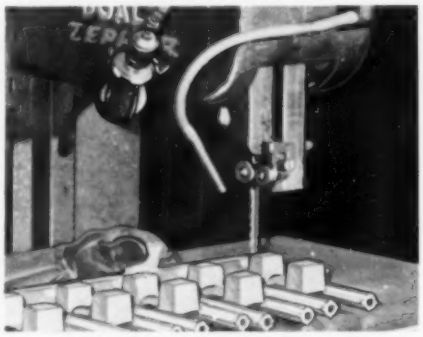
Your local DoALL Service-Store will demonstrate new DoALL Band Machines and Blades upon request without obligation. Call DoALL or write The DoALL Company, Des Plaines, Ill.

Model Z-16
16" throat. Speed variable 1200 to 6000 ft. per min.

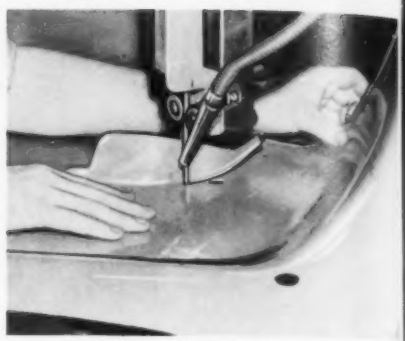
Model Z-26
26" throat. Speed variable 2000 to 10,000 ft. per min.

Model Z-36
36" throat. Speed variable 1200 to 6000 ft. per min.

Model Z-
60" throat. eed variable 20 to 10,000 ft. pe min.



Friction sawing for steel and ferrous castings.



High speed sawing for metals, woods, plastics.

CALL DoALL Locally at these Sales-Service Stores in United States, Canada and Mexico

ALABAMA
Birmingham 4—800 N. 24th St.
Call DoALL: Birmingham 3-0502

CALIFORNIA
Los Angeles 21—1316-18 S. Santa Fe
Call DoALL: Trinity 3871
San Diego—(Customer Service)
1017 First Street
Call DoALL: Main 8-2840
San Francisco 3—952 Howard St.
Call DoALL: Garfield 1-4784

COLORADO
Denver 4—1187 Stout St.
Call DoALL: Alpine 7444

CONNECTICUT
West Hartford 10—607 New Park Ave.
Call DoALL: Adam 3-6261

FLORIDA
Jacksonville 7—1522 Gary St.
Call DoALL: Jacksonville 9-7087

GEORGIA
Atlanta 3—304 Decatur St., S.E.
Call DoALL: Walnut 5384

ILLINOIS
Chicago 39—4650 W. Fullerton Ave.
Call DoALL: Albany 2-5300
Rockford—123 Seventh St.
Call DoALL: Rockford 4-7848

INDIANA
Indianapolis 2—1401-3 N. Illinois St.
Call DoALL: Plaza 6496

IOWA
Cedar Rapids—624 Fifth St., S.E.
Call DoALL: Cedar Rapids 3-0616

MARYLAND
Baltimore 12—5621 York Rd.
Call DoALL: Hopkins 7-5340

MASSACHUSETTS
Brookline 46—89 Washington St.
Call DoALL: Longwood 6-9555

MICHIGAN
Detroit 27—15010 Plymouth Rd.
Call DoALL: Broadway 3-4141
Grand Rapids 7—410 Hall St., S.E.
Call DoALL: 5-2191

MINNESOTA
Minneapolis 4—1328 S. Fourth St.
Call DoALL: Atlantic 4341
(St. Paul—Prior 7666)

MISSOURI
Kansas City 6—1019 E. Truman Rd.
Call DoALL: Harrison 5857
St. Louis 6—1945 N. Broadway
Call DoALL: Central 3620

NEW JERSEY
Nutley 10—88 Park Ave.
Call DoALL: Nutley 2-6767

NEW YORK
Buffalo 23—1063 Kenmore Ave.
Call DoALL: Riverside 3424
New York 10—67 Lexington Ave.
Call DoALL: Murray Hill 4-1514
Syracuse 4—106 Cortland Ave.
Call DoALL: Syracuse 76-3193

NORTH CAROLINA
Charlotte 2—401 S. Mint St.
Call DoALL: Charlotte 4-2579

OHIO
Cincinnati 2—536 Sycamore St.
Call DoALL: Main 3929
Cleveland 3—6517 Euclid Ave.
Call DoALL: Henderson 2-1515

OHIO—(Cont.)
Dayton 4—365 Vermont
Call DoALL: Michigan 2121
Toledo 6—2952 Monroe St.
Call DoALL: Garfield 8309

OKLAHOMA
Tulsa—207 W. Archer St.
Call DoALL: 5-6651

PENNSYLVANIA
Philadelphia 24—2053-59 E. Glenwood Ave.
Call DoALL: Cumberland 8-7400
Pittsburgh 21—600 Rebecca Ave.
Call DoALL: Fremont 1-5200

TENNESSEE
Nashville—1923 Church St.
Call DoALL: 42-0605

TEXAS
Dallas 2—1628 Industrial Blvd.
Call DoALL: Riverside 4536
Houston 2—121 St. Emanuel
Call DoALL: Capital 6588

WASHINGTON
Seattle 22—520 E. Pike St.
Call DoALL: East 7500

WISCONSIN
Milwaukee 5—2427 W. North Ave.
Call DoALL: Division 2-2950

* * *

MONTREAL, QUEBEC
583 Inspector St.
Call DoALL: University 6-1264

TORONTO 10, ONTARIO
37 Clarkson Ave.
Call DoALL: Redfern 4238

MEXICO CITY, D.F.
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Vol. 3—No. 1—126M—1-54

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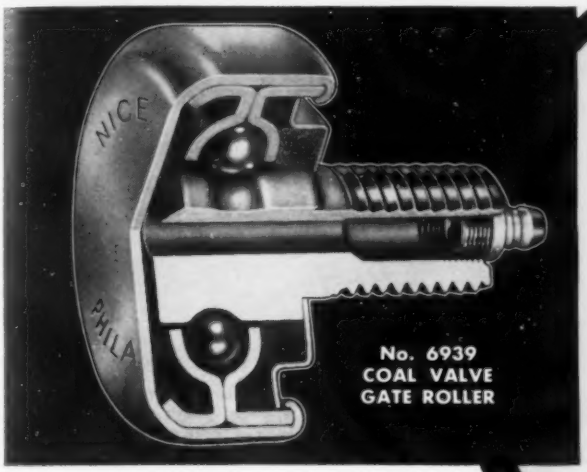
THE TREND is to Product Improvement & Lower Consumer Prices...



No. 6939
COAL VALVE
GATE ROLLER

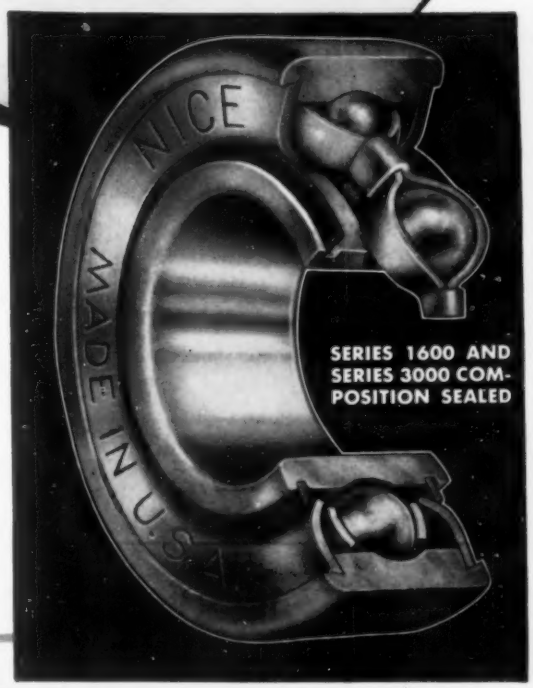
Once again forecasters and economists tell us that supply exceeds demand and only the alert and efficient will survive the "acid test" of the new Buyers' Market.

THE TREND, therefore, is to product improvement and lower consumer prices — and experienced NICE field men and factory engineers can help you accomplish these important objectives.

- Quality and Economy is combined in #6939 as a typical example of NICE experience and ingenuity as "Specialists in Specials." The outer tire and dust shield are of corrosion-resistant stainless steel. A felt seal retains lubricant and excludes foreign material and a grease fitting is provided for re-lubrication. Attachment is by means of the threaded stud.

- NICE is tooled to produce more than 2000 "specials," and more than 750 sizes and types of 25 different catalog standard Series are normally available from stock. Series 1600 (precision) and Series 3000 (unground) are illustrated. They are of the same "precision type" construction and are available shielded, sealed or open.

For complete information on the NICE LINE . . . . . write for Catalog No. 150.

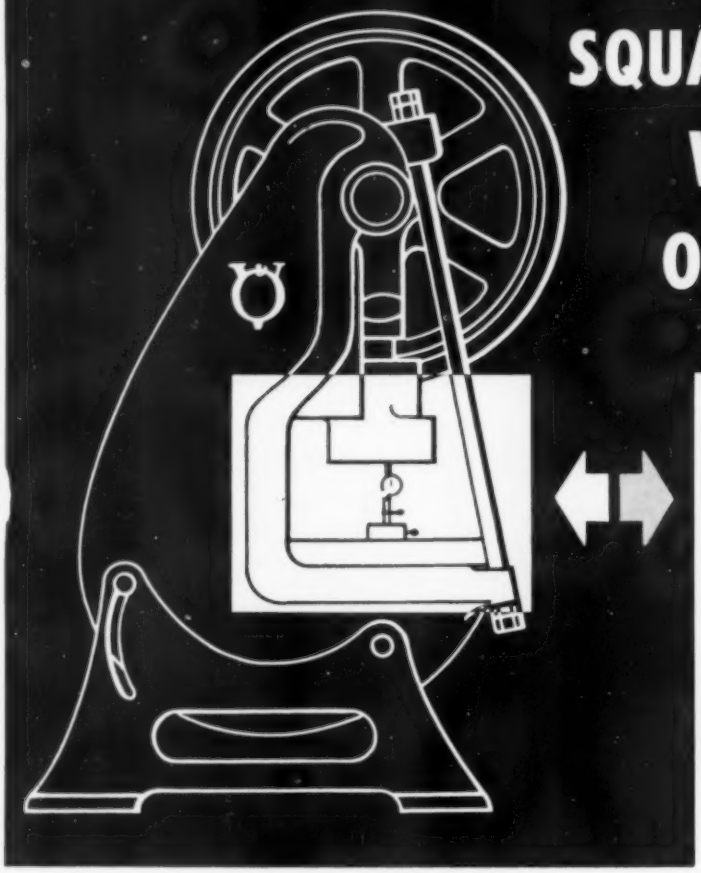


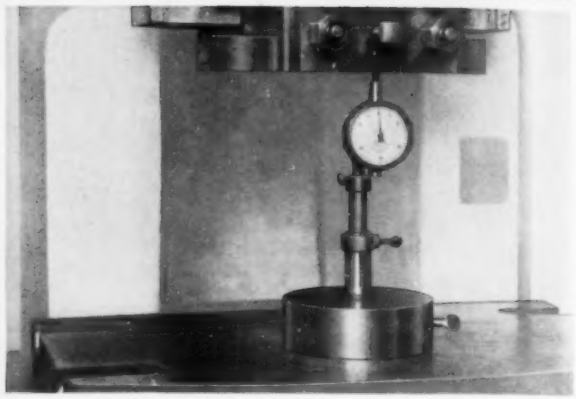
SERIES 1600 AND
SERIES 3000 COMPOSITION SEALED

NICE

NICE BALL BEARING COMPANY
NICETOWN · PHILADELPHIA · PENNSYLVANIA

SQUARE AND PARALLEL WITHIN .0005" ON A 4" STROKE





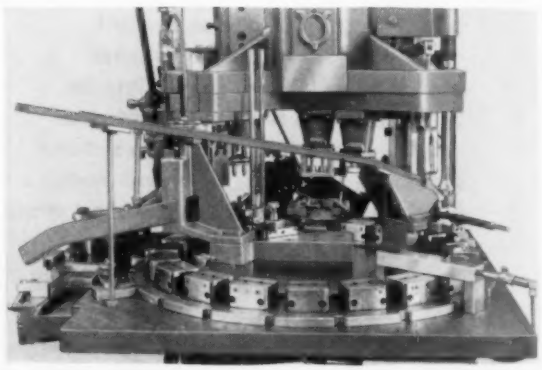
The dial indicator gage may not show a variance greater than .0005" when measuring any opposed points on these two surfaces. The same indicator is used with a ground steel square to check slide travel both F-B and R-L.

That sounds like a machine tool specification, doesn't it? Actually, it is a standard specification for a V & O long slide press: the press that is built like a high grade machine tool. We make special presses to even closer specs.

Operating precision of that order is very important if you want to use carbide dies, or fabricate thin materials, or do deep drawing, or work to high precision. You can do more, and do it better, when your press is highly accurate.

From our viewpoint, since we are going to use long slides we might as well build the rest of the press with accuracy to match. Otherwise, the precision of the long slide would be wasted. So we make extremely accurate ways and use them as reference surfaces with which all the tool carrying parts of the press must line up. And that gives you a press that will do a lot more for you.

Our representative would like to tell you more about the press that is built like a high grade machine tool. Write us, please.



Without high precision relationships between the tool-bearing surfaces and the slide travel of the press the maintenance costs of tooling of this complexity would be prohibitive.

Only the best is good enough

THE V & O PRESS COMPANY

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HUDSON, NEW YORK

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

65th Anniversary

★ *STOP AND SAY HELLO AT ASTE SHOW-BOOTH 1056*

WHY THE V&O LONG SLIDE PROVIDES BETTER ALIGNMENT

With the same running clearance, the longer the slide the less the possibility for angular misalignment. And we keep our running clearances very close indeed.

See the Saws

AT PHILADELPHIA

INDUSTRIAL EXPOSITION, A.S.T.E.

MOTCH & MERRYWEATHER

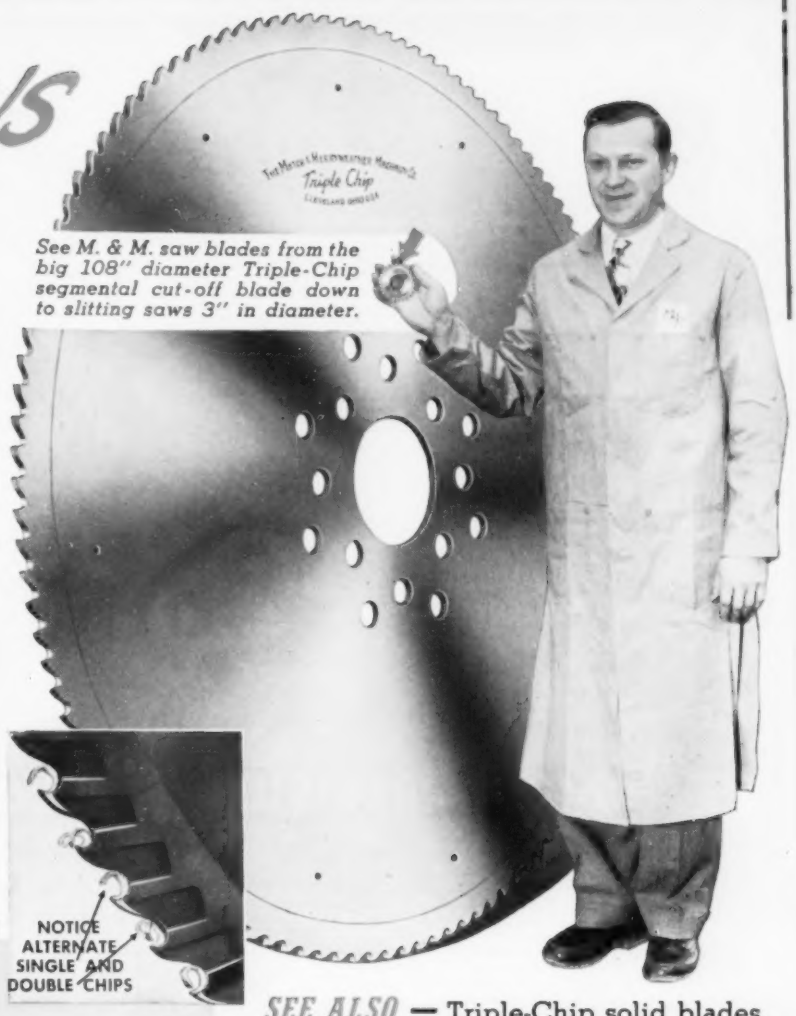
BOOTH 731

One stop here and you'll have the complete story on circular saw blades and face milling cutters. Triple-Chip Saw Blades cut off any machinable material, ferrous or non-ferrous, large or small, any shape, any thickness. Get the complete story, too, on slitting saws in all sizes and thicknesses, as well as on special saws. Our sales engineers will welcome an opportunity of talking with you about any problems you may have in this field — both at the Show and afterwards.

THE MOTCH & MERRYWEATHER MACHINERY CO.

Cutting Tool Manufacturing Division

CLEVELAND 17, OHIO



See M. & M. saw blades from the big 108" diameter Triple-Chip segmental cut-off blade down to slitting saws 3" in diameter.

The M. & M. Triple-Chip grind reduces tooth strains, lengthens blade life, and speeds production with accuracy.

Fifty Years 1904 · 1954

SEE ALSO — Triple-Chip solid blades, 8" through 20" diameter for cutting off smaller stock.

SEE ALSO — THE MOTCH & MERRYWEATHER KROSLOK MILLING CUTTER . .

Only 3 members — body, blade, wedge. Waffle design of blade mates rigidly with waffle in body. Cuts any machinable material. A profit-making investment in precision production milling.

SEE ALSO — MOTCH & MERRYWEATHER

Triple-Chip SLITTING and SLOTTING SAWS

3" through 8" dia.

Dual Drive reduces the hazard of blade breakage.

SEE ALSO — Motch & Merryweather Triple-Chip Heavy Duty Anti-Weld Soluble Oil.

SEE ALSO — M. & M. Master-Cut slitting and slotting saws, with optional Dual Drive. 3" through 8" diameter.

When you "SAVE"... YOU LOSE!

"Saving" by making your own punches is old-fashioned and expensive

Check your labor costs — your "down-time" — and order

PORTER PUNCHES

— for immediate delivery. Save time — save money — with top quality punches and die buttons. Look to Porter for *the punch you need... when you need it!*

Remember — you don't save by making your own punches — you *lose*.

"Still the best performer"

Here's why:

1. PORTER PUNCHES are available for immediate delivery. *... they save time — money — by keeping your expensive help at profitable jobs.*
2. PORTER PUNCHES are made to "stand the gaff." *... punches made in your shop are probably made from "available" material ... often the wrong metal for the job.*
3. PORTER PUNCHES are offered in standard—and decimal sizes. *... so your experienced help doesn't spend costly time "whittling."*
4. PORTER PUNCHES are reasonably priced. *... only a "specialist" can make punches as well—or as inexpensively.*

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Porter Punches are in stock in all principal cities. Send for complete catalog and prices—today!

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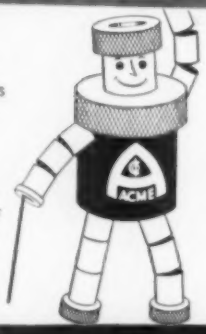

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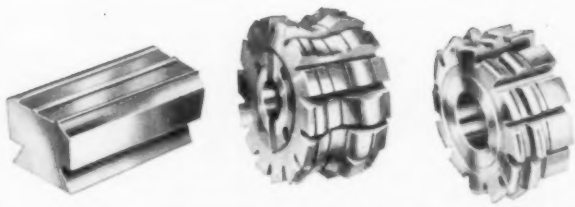

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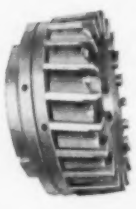

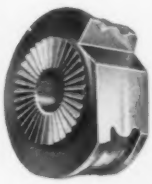

CLEVELAND CUTTER & REAMER CO.

Madison at 74th St., Cleveland 2, Ohio
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Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation, Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM TOOL STEEL ENGINEER SAYS:

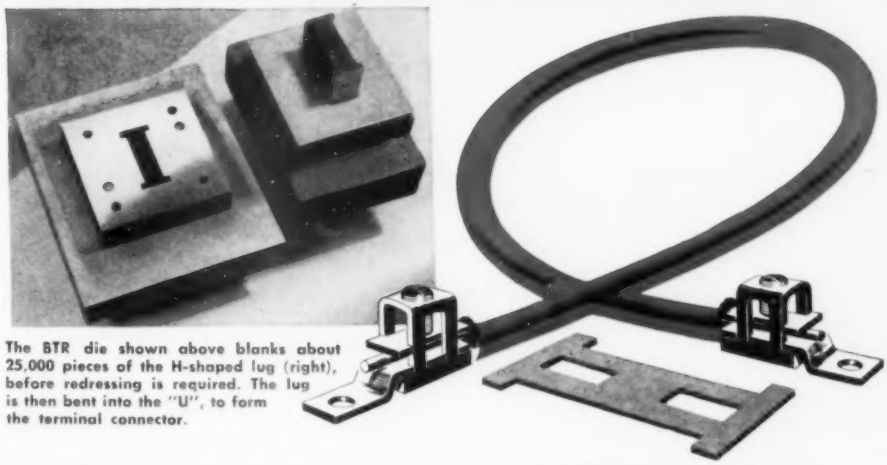
Be Sure to Heat Tools Uniformly

It has always been widely recommended that tools be heated uniformly to the hardening temperature. Unfortunately, this practice is seldom followed.

Absolute uniformity is impossible, as the outer surfaces of a tool must be heated before the interior. The uniformity of heating which results when a tool of constant cross-section is heated, by first preheating and then transferring to a furnace operating at the hardening temperature, is generally satisfactory.

However, when a tool of varying section is encountered (for example 1 in. at one end, and 3 in. at the other end), uniformity of heating cannot be attained by heating in open furnaces. What's the answer? Simply pack the tool in cast-iron chips in a container. Heating through the chips occurs so slowly that the tool can be heated uniformly regardless of section variations.

This procedure can be followed with most types of tool steels — with one exception. With high-speed steels, cast-iron chips cannot be used because the cast iron melts at the temperatures used in heat-treating high-speed steels.



The BTR die shown above blanks about 25,000 pieces of the H-shaped lug (right), before redressing is required. The lug is then bent into the "U", to form the terminal connector.

BTR DIE BLANKS 25,000 LUGS FROM STRIP STEEL BETWEEN GRINDS

One of the parts produced by Pelham Electric Manufacturing Corp., Erie, Pa., is a solderless U-shaped lug, for use on panelboards and switchboards. The lug is blanked from hot-rolled strip steel, ⅛ in. thick. Engineers at the Pelham plant selected BTR for the die, and they've had every reason to be pleased with its performance.

The die, operating in a 25-ton press, has a Rockwell C hardness of 60-62. It's economical, because it produces 25,000 pieces between grinds, with only .008 in. to .010 in. removed in redressing. And it is standing up well on both counts — good wear-resistance and good shock-resistance.

BTR is our general-purpose oil-hardening tool steel of the manganese-chromium-tungsten-vanadium type. In addition to being resistant to wear and shock, BTR has a good reputation for low distortion, and for ease of machining and heat-treatment.

BTR — TYPICAL ANALYSIS

Carbon	0.90	Chromium	0.50
Manganese	1.20	Vanadium	0.20
	Tungsten	0.50	

BTR combines abrasion-resistance and toughness, making it suitable for a wide variety of tool-and-die applications.

• • • • • • • •

Big Babies Turn Out Shell Discs

This huge multiple punch-and-die set blanks 90-mm shell discs, 8⅞ in. in diameter, from .690 gage, C-1030 plate steel. The punches and dies are made of A-H5 tool steel, hardened to Rockwell C 50 to 55. They turn out about 4,500 pieces in an 8-hour turn, and require but a minimum of redressing. A-H5, our 5 pct chrome, air-hardening steel, is well known for durability, minimum distortion in heat-treatment and easy machining.

MACHINE OF

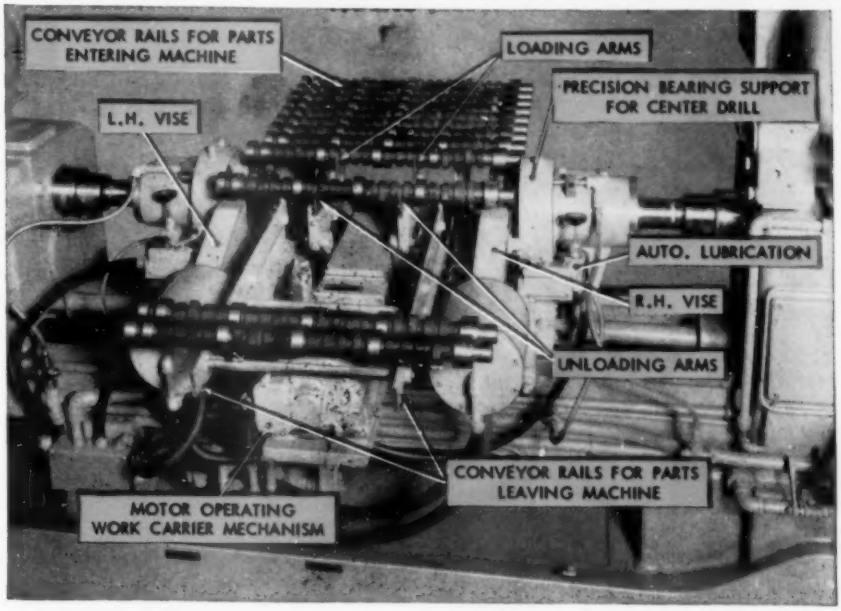
AUTOMATIC HANDLING CUTS CAMSHAFT CENTERING COSTS

Lo-swing Model CS Automatic Drilling and Centering Machine equipped with Automatic Handling Mechanism and Special Vises.

PRODUCTION COSTS

F THE MONTH

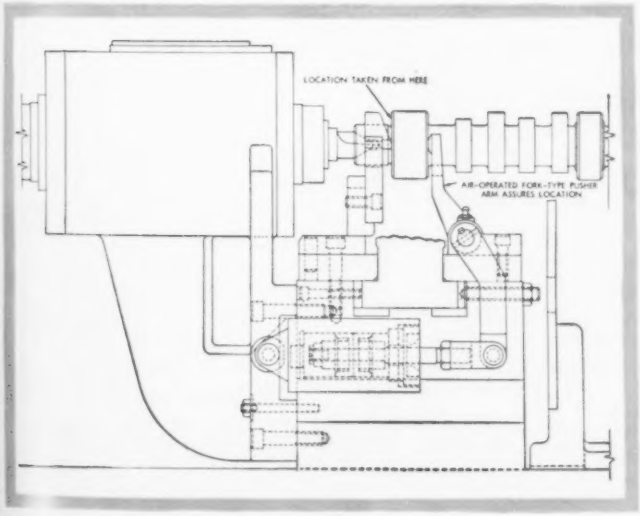
EPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



PROBLEM: To automatically handle and center both ends of eight-cylinder camshafts.

SOLUTION: The standard *Lo-swing* Model CS Automatic Drilling and Centering Machine selected for this job was equipped with a special Automatic Handling Mechanism and special vises. The close-up illustration provides a rear view of the vises, loading and unloading arms, and rails which guide the camshaft through the machine.

The camshafts arrive at the machine from the previous operation by conveyor and roll down to a fixed stop on the loading rails. At the end of the machine cycle, the center drills retract and the vises open, allowing the finished piece to drop into a stationary cradle, which is positioned slightly lower than the center line of the vise jaws. An electrical contact then starts the work carrier motor, imparting a rotating movement to the work carrier arms which handle a rough and finished piece simultaneously.



The unloading arms remove the finished piece, depositing it on the conveyor rails leaving the machine, while the loader arms, in their trajectory, pick up a rough part and lower it into the vise jaws where it is automatically clamped in position. The machine starting clutch is then automatically engaged and the part centered, which completes the cycle. The entire operation is automatic, no operator being required.

The close-up illustration shows a finished part being removed from the vises and a rough part just being lowered into the vise. The line drawing shows the details of the automatic positioning stop attached to the left hand vise.

Seneca Falls engineers are at your disposal for solving your AUTOMATION problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

S ARE LOWER WITH *Lo-swing*

New-

to meet today's demand for higher accuracy, closer tolerances . . .

It's Accuracy Is Built In!

PRE-LOADED BEARINGS
Twin high-precision roller bearings are pre-loaded after center is assembled. Point is then ground in its own bearings. Eccentricity tolerance is limited to plus or minus .0001". All parts are hardened and ground.

NEW DOUBLE SEAL FOR LONGER LIFE AND CONTINUOUS ACCURACY
Efficient "Universal" Seal consists of a stationary hycar sealing ring in the cap and a slinger rotating with the point. Hycar ring keeps out dirt, chips and coolant — slinger keeps grease in.

IDEAL

"UNIVERSAL"

Live Center

Accurate to ± .0001"!

High Load Capacity for a Wide Range of Jobs.

If you use lathes, here is important news!

Now, with the all-new IDEAL "Universal" Live Center you can have all the advantages inherent in freely turning live centers—higher turning speeds, deeper cuts, freedom from gouging and burning, chatter and center point lubrication—with turning accuracy held to plus or minus .0001". In addition, the "Universal" Live Center gives you the safety of load capacity beyond most normal requirements. This means you can *profitably* use its greater accuracy for many more jobs and you don't have to pay a premium—the "Universal" is economically priced. Available in Morse Tapers 2, 3, 4 and 5, for work up to 5630 lbs. Immediate delivery, if you order now!

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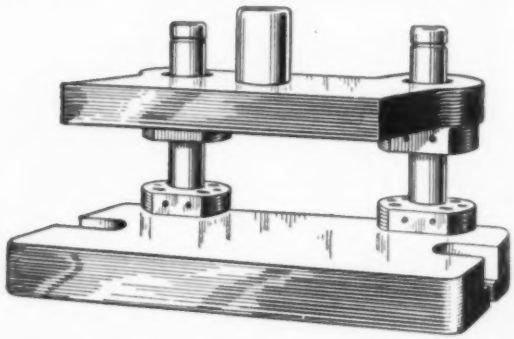

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You can save Time and Money when making work holding tools for small parts of square, rectangular or irregular section.

Cerromatrix Speed Chucks and Nests for Drill Jigs are made in a jiffy with almost no machining.

Be prepared for the next tough chucking problem. Write at once for Bulletin B5 to get full details.

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See Our Exhibit ASTE Exposition, Philadelphia, April 26-30 incl.

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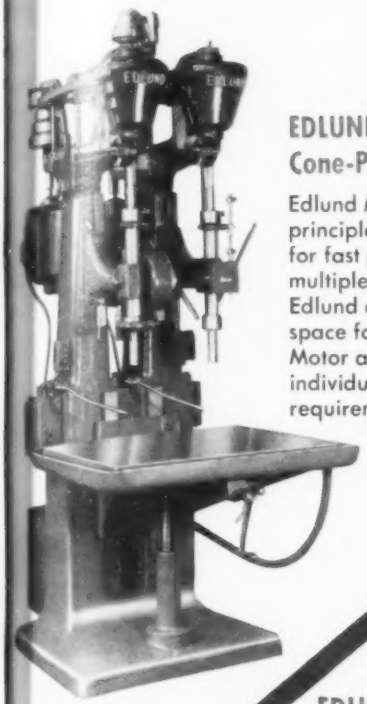
Applied Experience To Save You Money

EDLUND Drilling and Tapping Machines

Modern design — customer shop proved for increased production . . . longer tool life . . . greater accuracy . . . faster work handling.



EDLUND Vertical Motor Cone-Pulley Drive—Model B

Edlund Model B machines incorporate the best principles of design and rugged construction for fast production at low cost. Single and multiple spindle machines. Practical Edlund attachments. Ample table space for efficient work handling. Motor and spindle speeds for your individual operating requirements.

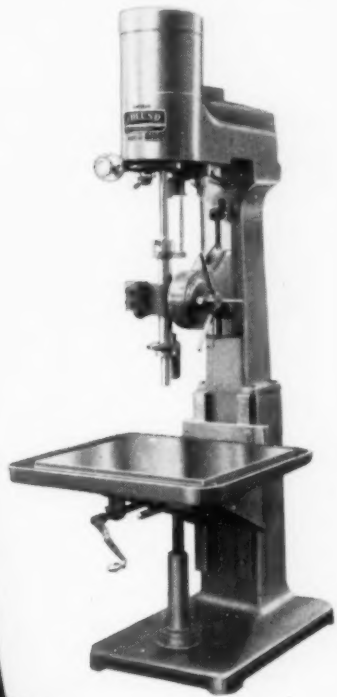
The complete line of EDLUND machines and years of practical engineering experience offer a solution to even the most complex drilling and tapping problems.

EDLUND Motor Spindle Model MS

A motor spindle high speed drilling machine with the rigidity essential to accuracy and long life. Built for general production and tool room service. All running parts ball bearing mounted and of rugged Edlund construction. Made in single and multiple spindle machines. Motors coupled directly to spindles meet demand for no-belt drive machines.

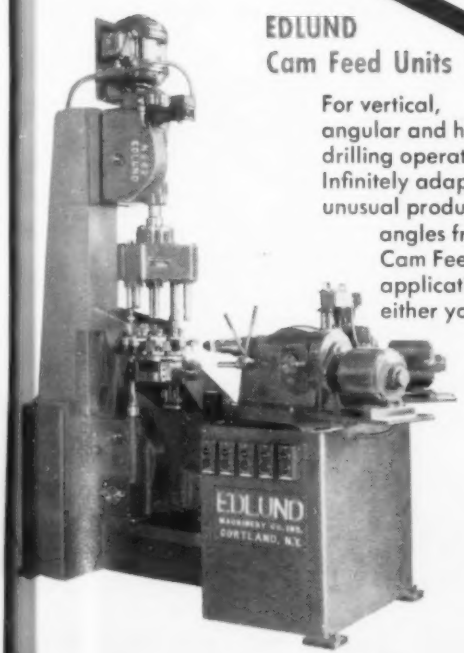
EDLUND Variable Speed Model 2F

The greatest advance in drilling machines in the past 25 years. Infinitely variable speeds result in production increases of twenty-five percent and more. Speed changes selected instantly without stopping. Longer tool life and increased production. One to eight spindle machines available.



EDLUND Cam Feed Units

For vertical, angular and horizontal drilling operations. Infinitely adaptable to meet unusual production problems and drill at angles from main machine operations. Cam Feed Units step up production, cut costs and applications are limited only by the ingenuity of either your or our engineers.



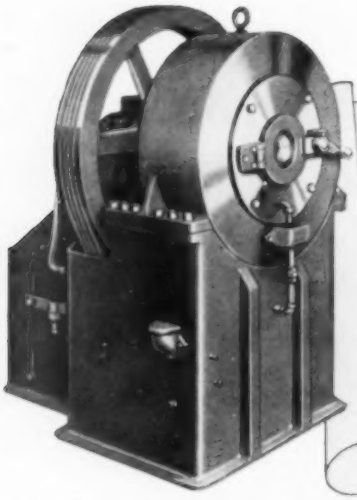
For detailed specifications on the EDLUND Line of Drilling and Tapping machines write for Edlund Bulletin G 53

Dealer Representation in Major Cities

EDLUND

MACHINERY COMPANY
Cortland, New York

Affiliated with Precision Castings Co., Inc. Division Bradley Edlund Corp.



Swaging Success Stories

Mandrel Swaging...for time and cost savings

Look at the savings!

1. Saving in time—swaging is fast, increases output.

2. Saving in labor—swaging can be done by unskilled labor.

3. Saving on machining—swaging reduces metal, does not cut it away wastefully.

4. Saving on rejects—the one piece tube is a generally better product than the assembly—has a better finish, better resiliency.

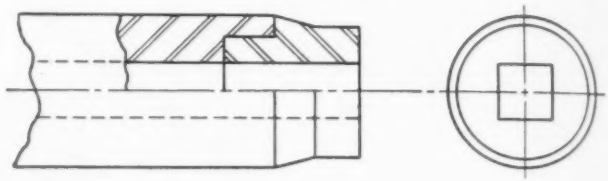
An informative booklet on swaging containing complete descriptions of Torrington Rotary Swagers is yours for the asking. Send for it today; it may save you money tomorrow.

See Torrington Swaging Machines in action.

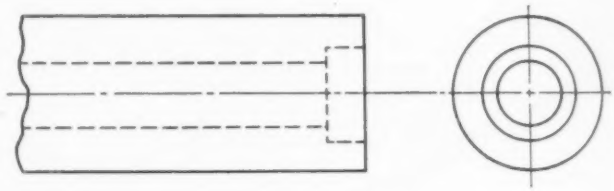
VISIT BOOTH 964

at the ASTE Industrial Exposition, Philadelphia, April 26-30.

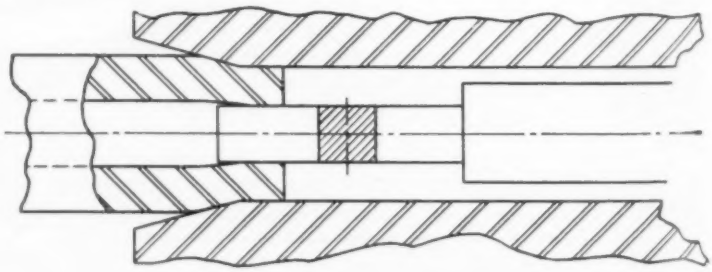
THE TORRINGTON COMPANY
Swager Department
444 North Street, Torrington, Conn.
Makers of Torrington Needle Bearings



This connector tube has a 3/8″ bore, and one end is fitted with a turned nose piece which has a 5/16″ square broached hole to receive a square driving rod. The cost of the tube was greatly influenced by the cost of making and assembling the nose piece.



Torrington swaging experts were able to eliminate the assembly and turning of the nose piece by simply redesigning the blank tube.



Result—one swaging operation over a square mandrel, and the piece was finished except for squaring up the end.

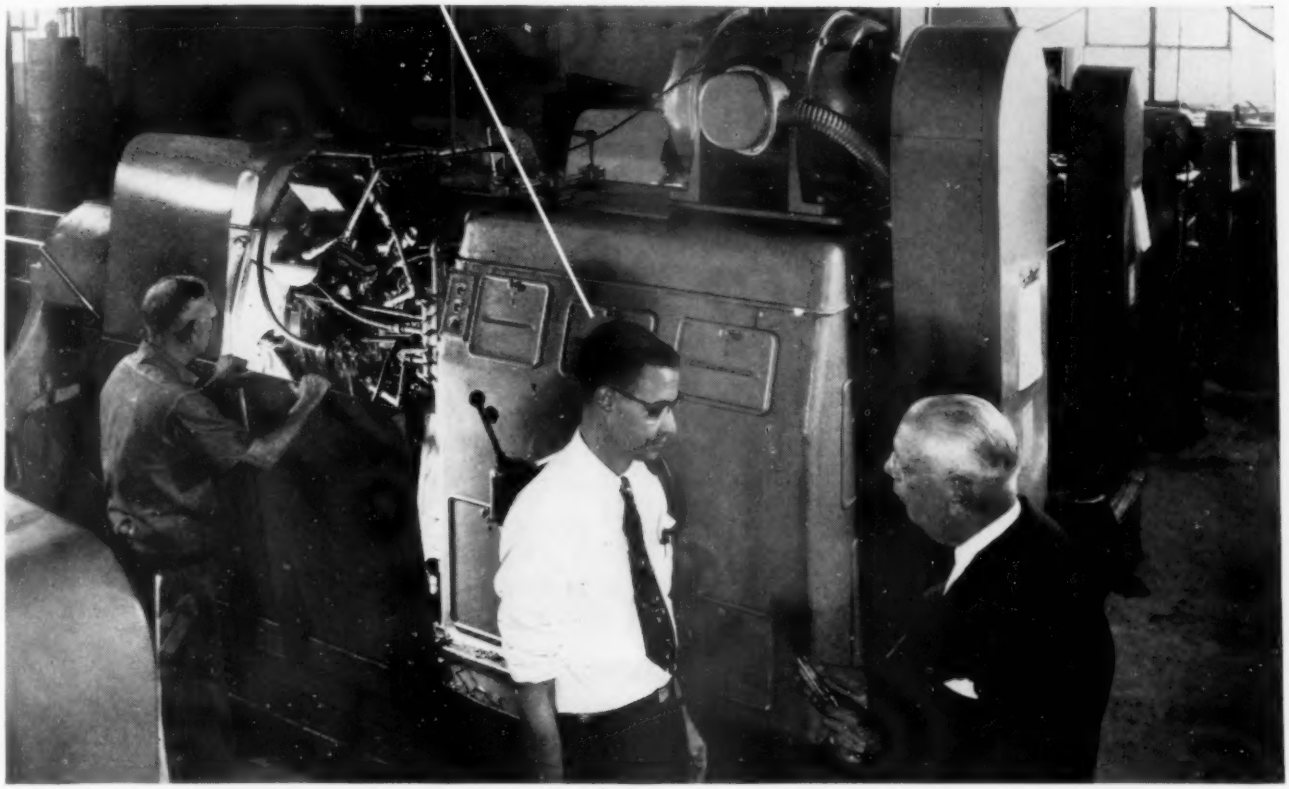
TORRINGTON ROTARY SWAGING MACHINES

"For good tool life on our Acme Gridleys we use

GULF STAINLESS CUTTING OIL

—It's an excellent cutting oil and lubricant"

says Mr. Paul Nippert, President, Nippert Electric Products Co., Columbus, Ohio



In machining special commutator nuts out of AISI 1018 and 1137 Steel, nine operations are performed on these 6-spindle Acme Gridleys. Tools are high-speed steel.

"We save time and money with Gulf Stainless Cutting Oil," says Mr. Nippert. "Using it as both cutting oil and lubricant, we avoid contamination and dilution problems, and we keep production at a high level. Then too, we have proved that it is noncorrosive to bronze machine parts."

This is one of scores of shops that have reduced machining costs through the use of Gulf Stainless Cutting Oil. For additional information, call in a Gulf Sales Engineer, or write for a free pamphlet on this outstanding product.

GULF SERVES INDUSTRY

Gulf Oil Corporation
Gulf Refining Company
1822 GULF BUILDING, PITTSBURGH, PA.

OSBORN

Here's better quality at lower cost . . . New Osborn Brushamatic No. 4 Machine. Handles metallic and non-metallic parts up to 100 pounds. Here, it is set up to deburr and blend teeth of sprocket.

Choose your weapons!

HOW are *you* going to answer the challenge of competition when it comes to your deburring and finishing operations? By hand? Or, by machine . . . with the Osborn Brushamatic? You'll far outclass the old manual deburring department in *quality* of work and in *economy* when you convert to Osborn's automatic power brushing.

At the push of a button, Brushamatic machines remove burrs and feather edges, blend surface junctures and clean parts thoroughly. Results are absolutely uniform . . . piece after piece. Scrap loss is nil. Service life of part is increased through elimination of stress-concentrating scratches. And it turns out work about *5 times as fast* as hand methods.

Find out how *you* can apply this modern method to *your* production. Call your nearby Osborn Brushing Analyst or write *The Osborn Manufacturing Company, Dept. K-8, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

INFORMATION:
Write today for your copies of booklets on Automatic Deburring and on Brushamatic Machines.

SEE IT AT OSBORN BOOTH 627, ASTE SHOW.

Osborn Brushamatic

BETTER QUALITY... LOWER COSTS... AT THE PUSH OF A BUTTON

Industry discovers a new helping hand

One of industry's greatest new production tools is the Sahlin "Iron Hand". Many hundreds of installations in America's leading factories prove the tremendous value of these automatic and self-contained unloaders...indeed, Sahlin has helped automation come of age.

Introduced in 1947, the Sahlin "Iron Hand" is now widely accepted. Virtually all of the large stamping plants in the world use this swinging arm to unload all types of stampings—large and small. And it can be applied with equal efficiency to brakes, shears and forging machinery.

The savings in manhours that the Sahlin "Iron Hand" has provided are truly staggering...major production increases have been achieved in numerous plants—in some cases running into several hundred percent. Safety records show substantial improvement. The total savings provided by these factors have convinced management of *the dependability, the economy of the Sahlin "Iron Hand" in America's swing to automation.*

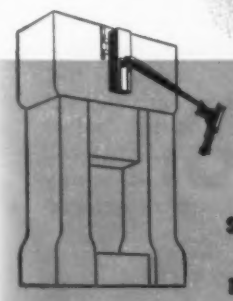
Moreover, the "Iron Hand" principle has been adapted by Sahlin to a combination feeding and unloading device and in a special horizontal arrangement for die casting machines. It is also available in a floor-type design for high-speed production of small parts.

You'll find the Sahlin "Iron Hand" can be equipped with a gripping jaw to handle practically any press stamping. Write for a catalog today.

SAHLIN ENGINEERING COMPANY
267 Ferndale Street, Birmingham, Michigan

Representatives in: Cleveland • Dayton • Pittsburgh • Philadelphia • Seattle
Indianapolis • Los Angeles • San Francisco • London • Paris • Milan

SAHLIN IRON HAND —*to raise pressroom standards*

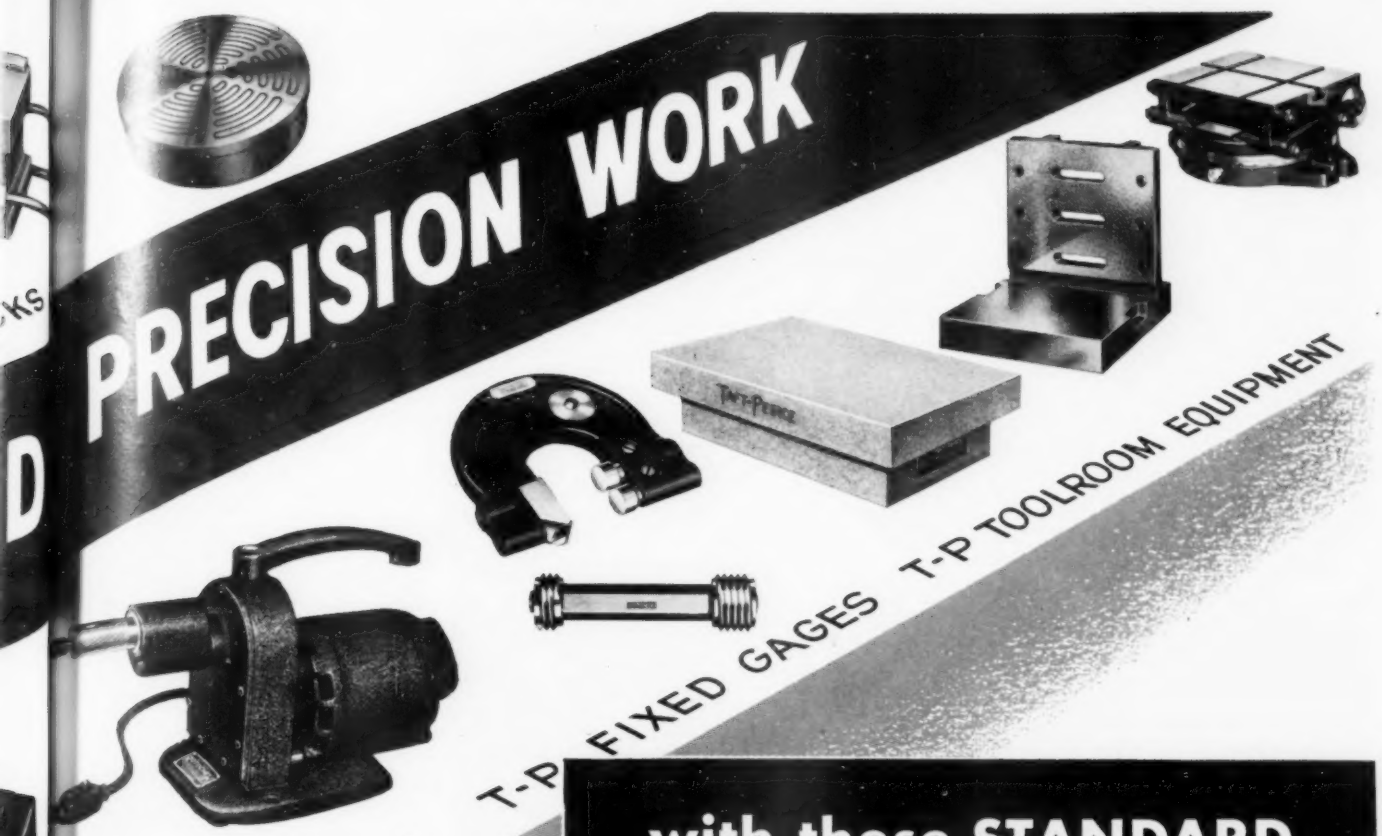


SAHLIN

SWINGING ARMS (4 SIZES)

FLOOR TYPE—FIXED AND ROLL-AWAY MOUNTS • HORIZONTAL DESIGN • VARIOUS GRIPPING JAWS

T-P SUPERPOWER MAGNETIC CHUCKS
SIMPLIFY and SPEED
T-P MACHINE TOOLS
T-P CompAIRator



with these STANDARD TAFT-PEIRCE PRODUCTS

Chances are you're already using many items from some of these Taft-Peirce product lines. You should know them all. Each has certain exclusive advantages that set it apart from competitive products. Many of them are actually not competitive at all — since in their own specific field of application, nothing else compares. For example:

T-P Superpower Electro-Magnetic Chucks pack more power in less space. New T-P Permanent Magnet Chucks are longer, stronger, 20% lower — give greater clearance on machine tool tables.

T-P #1 Surface Grinders and Lapping Machines make it easy to produce surfaces to an accuracy, flatness, and finish previously considered difficult or impossible.

T-P CompAIRators measure a wider range and variety of work than any other air gage. The COMPUTING CompAIRator also solves simple problems...simplifies many complex measurements.

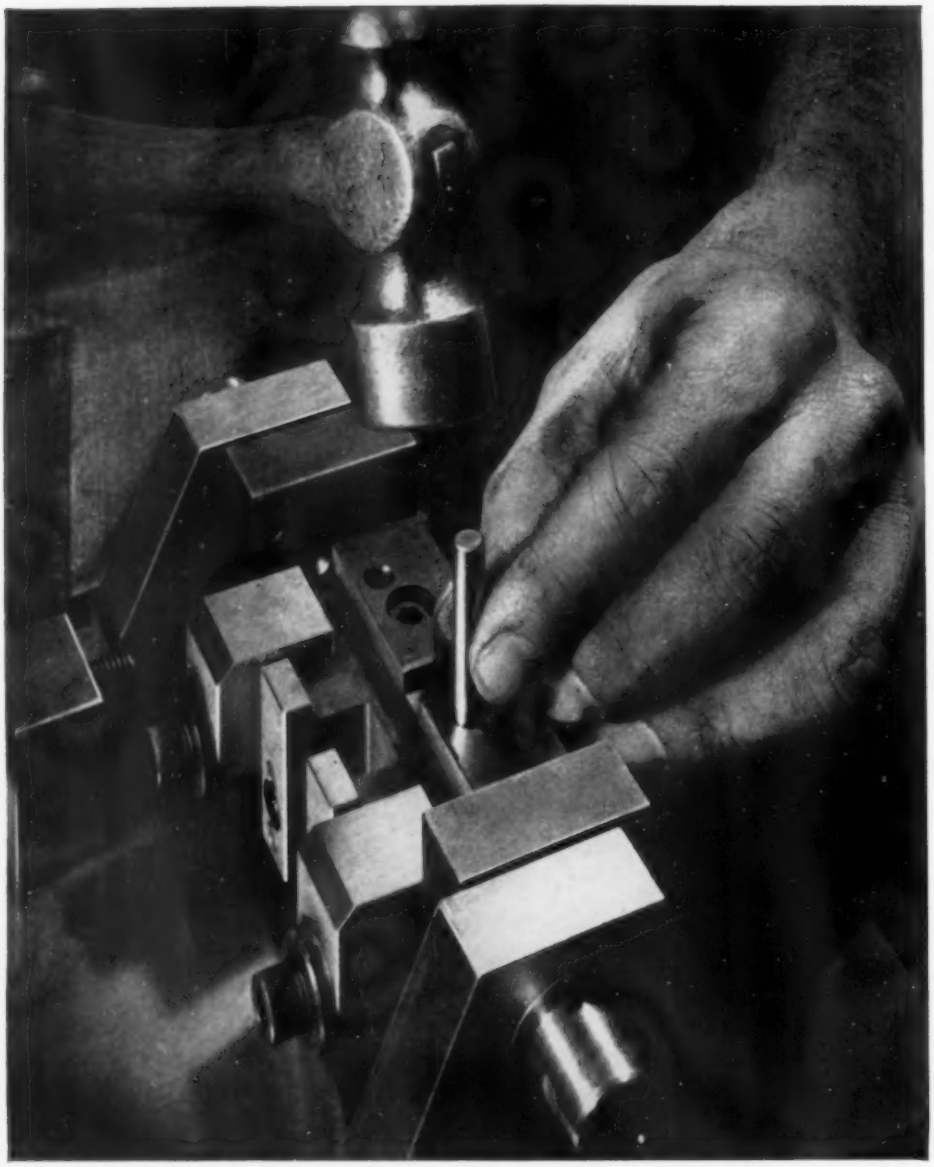
T-P Rotochek, a valuable part of the T-P line of fixed gages, is the fastest thread gaging method yet devised. Just push — and the gage enters the work. Pull — and it disengages automatically.

T-P Tool Room Equipment includes many special time-and-labor-saving devices such as Multiplex Angle Irons, the extra wear-resistant T-P Granite Surface Plates, and Precision Levels to mention only a few.

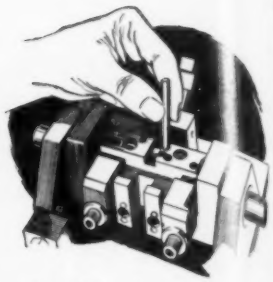
Each of these products is part of a complete Taft-Peirce line. Available in standard or special models tailored to your needs. Full details are described in the new Taft-Peirce Handbook. Write for your copy today.

T-P means Top Precision

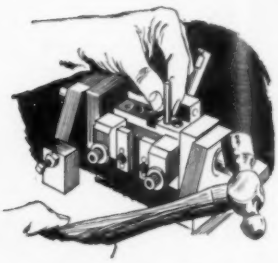
THE TAFT-PEIRCE MANUFACTURING COMPANY • WOONSOCKET, RHODE ISLAND



UNBRAKO Precision-Ground Dowel Pins are widely used for aligning parts, as in dies, jigs and fixtures. This radius grinding fixture, for putting a flat on electronic shafting, is a good example of such an application.



Assembler inserts formed end of UNBRAKO dowel pin into hole preparatory to tapping it into position.



Formed ends, with continuous grain flow, won't chip. Uniform heat treatment permits UNBRAKO dowel pins to be driven in and out of holes without upsetting.

UNBRAKO dowel pins—made of heat treated alloy steel—have a surface hardness of 60-62 Rockwell "C" Scale; a surface finish of 6 microinch maximum; a core hardness of 50-54 Rockwell "C" Scale; an average single shear strength of 150,000 psi; and a diameter tolerance of ±0.0001". They are available in two standard sizes in diameters from ⅛" to 1".

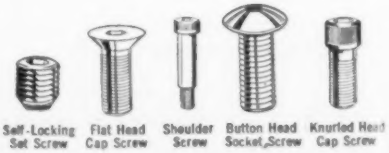
Keep your inventory at a minimum
Use UNBRAKO Standards—stocked by your distributor

Because your UNBRAKO distributor stocks a full line of standard UNBRAKO socket screw products, your inventory is lowered. This ready supply not only cuts your investment, but gives you faster delivery and reduces your buying costs. For a complete listing of standard UNBRAKO products, see your distributor or write STANDARD PRESSED STEEL CO., Jenkintown 37, Penna.

See us at Booth 1539, Convention Hall, Philadelphia, Pa., during the A.S.T.E. Show, April 26 to 30.

UNBRAKO® SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA



lose-Up Look Tells Why... THE NEW 12" SWING

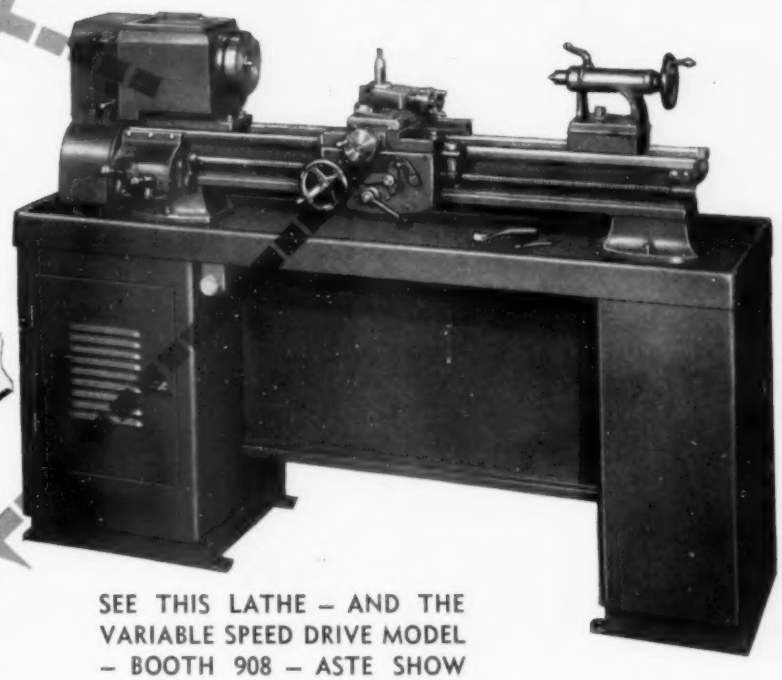
LOGAN LATHE

DELIVERS PLUS PERFORMANCE

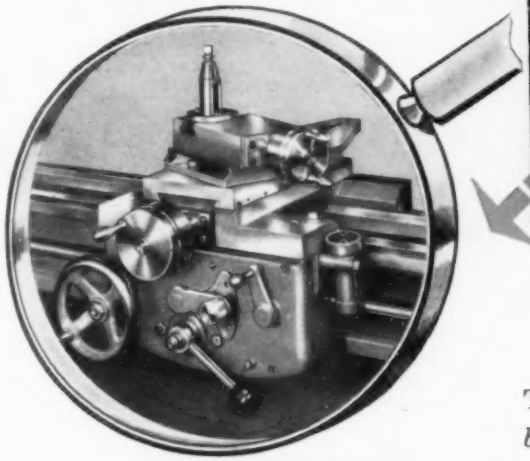
For Production, Maintenance, Tool Room or School Shop

The HEADSTOCK Is Massive, Rigid, Convenient

Massively proportioned spindle means extreme rigidity on heavy cuts. Oversize ball bearing mounting assures sustained spindle accuracy. Outboard V-belt drive transmits power with maximum efficiency and simplifies belt changing or adjustment. Accessible gear-shift knobs add to operating convenience and safety.



SEE THIS LATHE – AND THE VARIABLE SPEED DRIVE MODEL – BOOTH 908 – ASTE SHOW



The CARRIAGE Is Newest, Finest Construction

Simple, lever-operated disc type clutch gives new operating convenience. Easily read, widely separated graduations on the extra large dials permit accurate readings. Precision ground top surfaces on cross slide and saddle permit mounting fixtures and use of magnetic indicators. Extra wide and long bearing surfaces on cross feed slide. Heavy, massive compound for rigidity. Apron operates in bath of oil.

The closer you inspect this new 12" swing Logan Lathe, the *better* it looks. The advanced design of individual parts, and the precision construction throughout become more evident. You will like the size, too. Its 35" center distance, 1⅜" spindle hole, 1" collet capacity, and rugged, massive proportions mean extra capacity, stability and power. Keep this newest Logan in mind as you make plans for your production line, tool room, shop, or student training program. The quality you see in your close-up look will serve you well through extra years.

SEE IT AT YOUR LOGAN LATHE DEALER'S, OR

Write for Information...

Full catalog descriptions and price information on request. ***Write today to***

Logan
ENGINEERING CO.
Lawrence and Lemon Avenues
Chicago 30, Illinois

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

Brief Specifications of Logan 12" Lathes

Swing over bed and saddle wings, 12"... Center Distances, 23" and 35"... Turret Lathes Models have 43" bed length... 1⅜" spindle hole ... 1" collet capacity ... 16 spindle speeds, 38 to 1260 rpm.

Open Season on Buck$ right in your own plant!

Production men who are tracking down lost bucks in plant operations may have overlooked the tremendous money-saving opportunities in the field of metal cleaning. Many plants are *wasting real money* because they sometimes don't think of metal cleaning as a primary operation. Yet metal cleaning is vitally essential to the making of a good product.

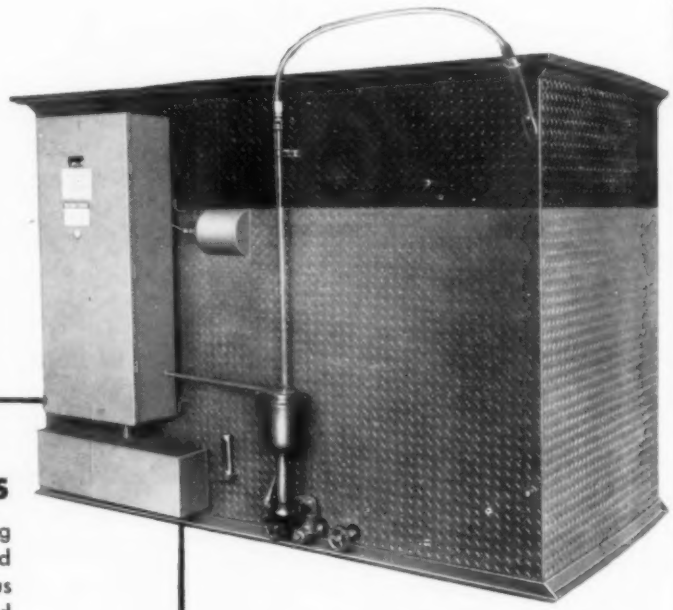
Every dollar saved in cleaning is a dollar earned. That's why it pays you to investigate all possible ways to save on cleaning operations. And that's where Phillips' modern metal cleaning method comes in. *You can save more money* and build your product *better, faster and cheaper* with Phillips degreasers because they clean faster, use less solvent and operate on minimum power requirements.

For the complete Phillips high production metal cleaning story check with your Phillips man today. He'll be willing to go into your problem fully and recommend the right combination for lowest costs, and highest production. Do it today!

WITH

PHILLIPS

VAPOR DEGREASERS



SEND FOR THESE FREE BULLETINS

PHILLSOLV BULLETIN giving complete details on physical and chemical properties of Phillsolv, plus full details on advantages and application.

COMPLETE INFORMATION on the Phillips line of electric batch type and automatic vapor degreasers. Models to meet any need.

DEGREASING HANDBOOK gives questions and answers on degreasing processes and problems. Technical information on degreaser applications.

Phillips

MANUFACTURING COMPANY

3455 W. Touhy Avenue • Chicago 45, Illinois

ENGINEERED METAL CLEANING EQUIPMENT

The trained seal has earned a place in the entertainment world through an unusual sense of balance.

Balance

Bath Taps have earned a place in the world of precision tools because their "balance-in-motion" always assures a professional performance.

Check these basic built-in features:

UNIFORMITY — No variation. Steel is heat treated to uniform hardness before threads are ground.

CONCENTRICITY — No variation. Shanks, major diameter and flutes are ground on a common center.

CONTROL — No variation. Pitch diameter, lead, angle, flutes and chamfers are kept right "on the nose" for measure and spacing.

At Bath . . . all steps of manufacture are planned in harmonious relation to each other . . . to give the tap perfect functional balance for producing accurate threads to specifications.

For reliable, all-around, every-day thread cutting precision . . . buy Bath Taps. A Bath representative will be glad to show you how to balance your tap-production figures.

Bath engineers check every detail, to see that all Bath Taps are conditioned to do the best threading job for your requirements.

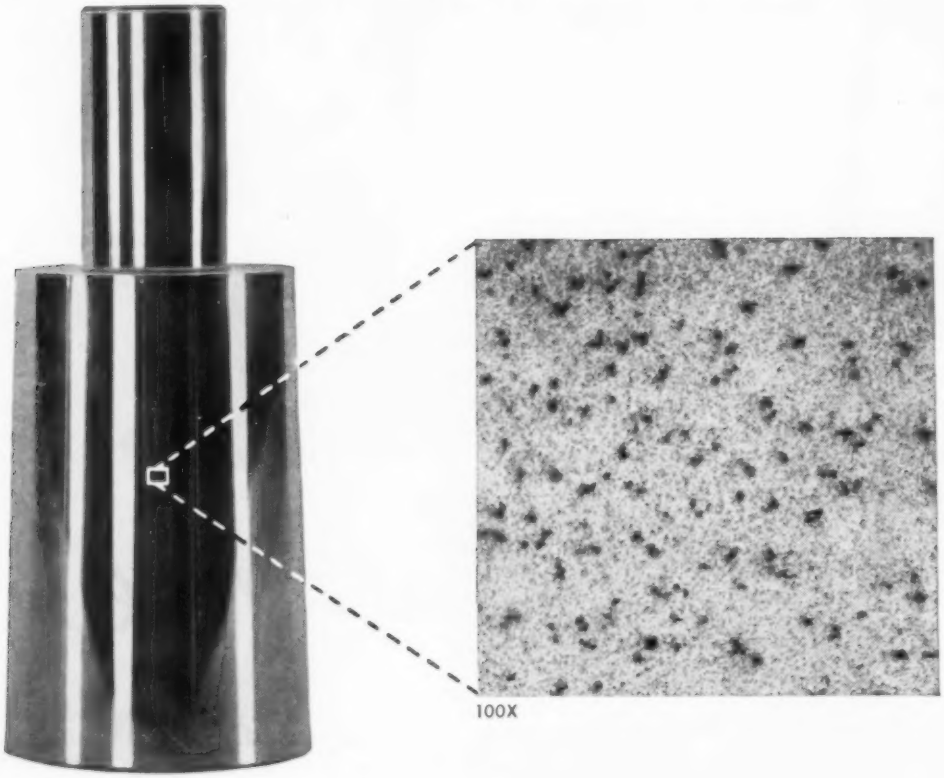
Insist on BATH TAPS for BETTER THREADS

JOHN BATH & CO., Inc.

28 Grafton St., Worcester, Mass.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

You can see why Graph-Mo® outwears other gage steels 3 to 1!



GRAPH-MO® steel is a *different kind* of gage steel. And the difference between Graph-Mo and ordinary gage steels is so real you can *see* it!

A piece of polished Graph-Mo steel has a "graphitic look"—tiny, scattered, parallel marks barely visible on the surface. These marks are the result of free graphite in the steel's structure. And this free graphite, together with diamond-hard carbides, enables Graph-Mo to outwear other gage steels an average of 3 to 1. Reports from dozens of gage users who've switched to Graph-Mo prove it! (Details on request.)

The photomicrograph (above) shows the free graphite and diamond-hard carbides that give Graph-Mo its unusual wear resistance. They also minimize scuffing, pick up and galling, and resist abrasion.

Tests prove that Graph-Mo is the most stable gage steel ever made, too! After a 12-year period, a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch change from its original measurement.

And constant-pressure machinability tests show Graph-Mo machines 30% faster than other gage steels. (Machinability test data on request.)

You can always tell Graph-Mo by its "graphitic look". This built-in "trade-mark", the result of the free graphite in its structure, can't be duplicated in other steels. Look for it, insist upon it, next time you buy gages. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

they check out OK

OHIO KNIFE SLITTER KNIVES AND SHEAR BLADES are preferred by Metal Working Plants and Steel Warehouses

1. less downtime
2. longer runs
3. less regrinding
4. precision performance

4 ways better

Here's Why Ohio Knife Co. slitting and shearing knives earned this reputation primarily by reducing "downtime". Production savings are realized because Ohio Knives give longer runs, require less regrinding and deliver precision work even on the toughest jobs. OK Slitters are made from the finest tool steel, precision ground to ± .0002 tolerances on thickness, diameter and bore. OK Shear Blades are specially heat treated to bring out best characteristics for different jobs, to give maximum toughness and keen edge-holding qualities. Our engineering department is at your service for recommendations on your slitting and shearing problems. Write Dept. U

Manufacturers of OK WELDED HIGH SPEED SHEAR BLADES • OK SOLID STEEL SHEAR BLADES • OK SLITTER KNIVES • ROTARY SHEARS, CUTTERS, CHIPPERS, TRIMMERS

GO WITH OHIO GREEN

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

ARROW TOOL & REAMER CO., Established 1916

SPECIAL CUTTING TOOLS FOR 36 YEARS

• SUBLAND DRILLS • MULTIPLE FLUTED TOOLS •

ARROW produces Special Tools Quickly—Economically

Carbide or H. S. Steel

Send your prints today or write for details

ARROW TOOL & REAMER CO.

418-422 LIVERNOIS AVE. • DETROIT 9, MICH.

USE READER SERVICE CARD; INDICATE A-4-342-1

DYKEM STEEL BLUE®

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare, increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY

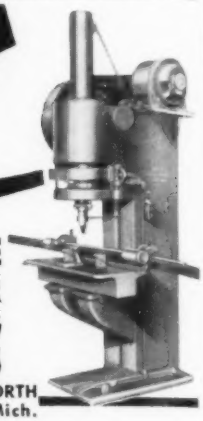
2303D North 11th St. • St. Louis 6, Mo.

USE READER SERVICE CARD; INDICATE A-4-342-3

YOU'LL GET MORE PARTS PER HOUR with a . . .

General

FLEXIBLE POWER STRAIGHTENING PRESS



General Manufacturing Co. 6435 FARNSWORTH DETROIT 11, Mich.

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Chicago RIVET "912"

AUTOMATIC RIVET SETTER

CUTS COSTS 3 WAYS

1 FASTENS FASTER . . . Only the speed of the operator limits the 912's riveting speed. Completely automatic. A push on the foot pedal automatically feeds, inserts and clinches the rivet.

2 DOES WORK OF SEVERAL MACHINES Quick change rotary hopper and raceway makes the 912 adjustable in 5 to 10 minutes to set different size rivets. Adjustable anvil height and 12-inch throat provide further versatility.

3 SAVES ON MAINTENANCE . . . The 912 is massively built to stand the shocks of constant use and is designed for quick, easy servicing and parts replacement.

If your assembly calls for 3/16" steel tubular rivets or smaller, of 15/16" lengths or less, ask us to show you how the 912 can cut your fastening costs. Send a sample of your problem assembly (or blueprint) for a free fastening analysis.

FREE CATALOG *contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.*

Chicago Rivet & MACHINE CO.

9619 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois

Branch Factory: Tyrone, Pa.

USE READER SERVICE CARD; INDICATE A-4-342-2

PRECISION INTERNAL FORMING TO MEET PRODUCTION DEMANDS

QUICK ADJUSTMENT AND POSITIVE ACTION make the **MAX-WELL-MADE** Model JF recessing tools especially suitable for use in today's high-speed production schedules.

This tool operates on any jig and fixture setup to cut snap ring grooves, "O" ring grooves and oil labyrinths as well as for inaccessible spot facing, external necking, precision undercutting, etc.

Accurate to within ±0.001-inch, Model JF is available in five sizes to pilot into standard bushings from 1" to 2¼ inches.

JF tools can be supplied with either standard Morse or adjustable adapter, quick-change, straight or special shanks.

Write today for catalog. (Model JF)

380-MC

THE MAXWELL COMPANY

251 BROADWAY • BEDFORD, OHIO

USE READER SERVICE CARD; INDICATE A-4-342-5

ANACONDA®
METALS AT WORK

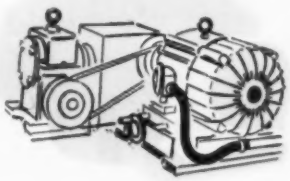
Copper "package" for the coldest products on earth

This container for storing and transporting liquefied helium (—452 F.) or hydrogen (—421 F.) is made by Superior Air Products Co. of Newark, N. J. The secret of keeping heat out to reduce evaporation is four concentric copper spheres separated by a high-vacuum space, a nitrogen protecting bath, and a second high-vacuum space — the entire unit enclosed in a stainless steel casing. Copper contributes ductility and malleability for spinning into hemispheres, unexcelled soldering properties for joining into spheres, and a mirror finish to reduce radiation losses. Need we tell you that it's made of ANACONDA Copper?

This "iron horse" runs on brass

The "High Iron" we're referring to is the HOBBYLINE HO-GAGE model railroad track which John A. English & Co. of Morrisville, Pa., makes of FORMBRITE** strip. This fine-grain, yet ductile forming brass produces a track so strong and stiff it will support an adult's weight. In products where finishing costs count, users find that FORMBRITE usually needs only a color buff to produce a high finish.

Flexible conduit enjoys a splash in a bath



The real trick is to make an electrical conduit that's flexible *and* liquid-tight *and* approved by Underwriters' Laboratories for such applications. SEALTITE* Type UA does all three. Made with a tough synthetic jacket extruded over a flexible steel core, it's shown here protecting wiring to motor in an auto laundry. It ignores not only splashing, but also oil and grease, and resists abrasion. Want more facts?

We put an end to "the bends"

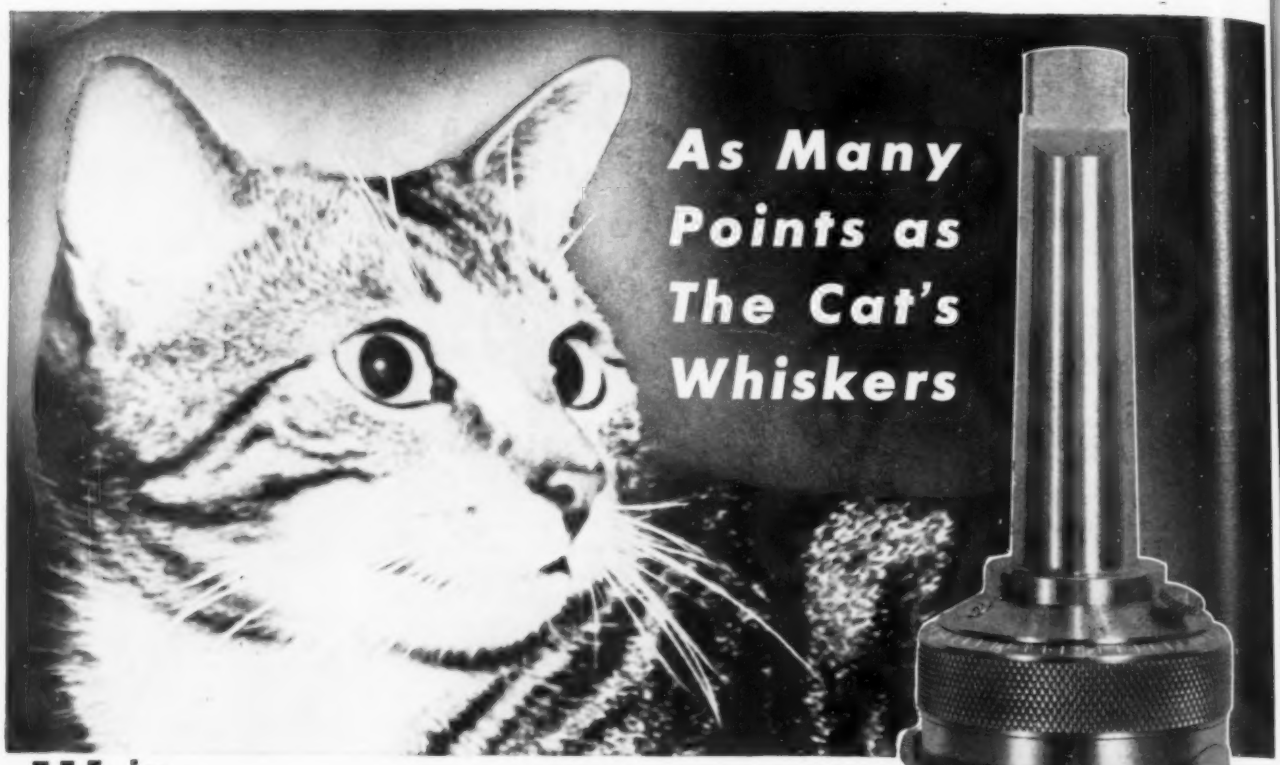
We don't mean the kind deep-sea divers suffer from, but the kind heating contractors had to put up with when they installed radiant panel heating systems. Heretofore, many contractors formed the panel grids on the job by hand-bending them from coils of tubing—a time-consuming, laborious, back-breaking job. Now PG's** have ended all that. They are the new, compactly packaged, accurately *preformed* ANACONDA Copper Tube Panel Grids . . . from the handy carton to installation is only a matter of minutes. PG's are another ANACONDA first.

A service for you

Our Technical Department has a range of experience that covers the entire field of copper and copper-alloy applications in industry. If you have a problem of metal selection, we are at your service. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Trademark
**Reg. U.S. Pat. Off. 5393

ANACONDA® *the name to remember in* **COPPER — BRASS — BRONZE**



Model "D"
For General Purpose Work on Medium Size Machines.

ALL in 1 Toolhead

BORING
FACING
TURNING
GROOVING
UNDER-
CUTTING

A Model For Any Size Machine

CHANDLER TOOL CO.
Muncie, Indiana, U. S. A.

Boring, facing, turning, grooving, undercutting, all in one set-up with Chandler Duplex.

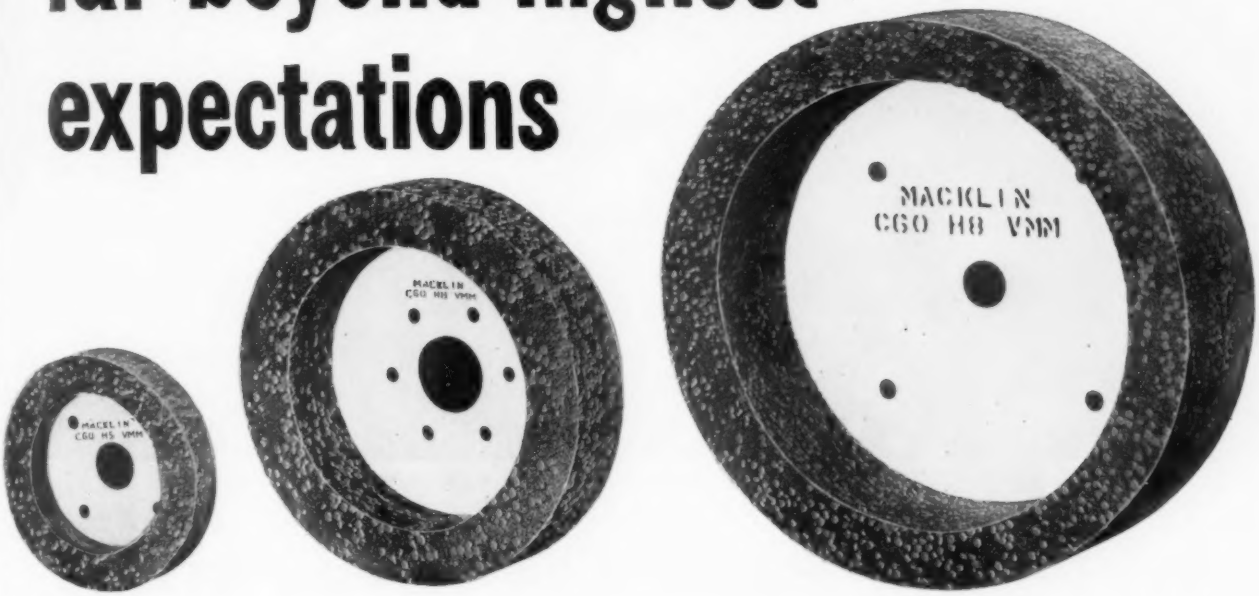
This boring and facing head has many points not found in conventional makes . . . such as power feed for facing, longer slide travel, extremely fine adjustment, tee slot positioning of cutting bar, universal range and adaptability. All shanks are interchangeable. Any type shank, straight or tapered, with tang or threaded for draw bar furnished. Feed screw dial calibrated to read .0005. Movement of slide .025 inch per revolution of screw. Standard equipment includes bar holder, boring bar ¾x4, extension bar for large work, slide stop, feed ring handle, and necessary wrenches. Shipped in special wooden container.

A Boring Head That Won't Face is NOT Complete

Chandler-Duplex

COMBINED BORING AND FACING TOOLHEADS

Amazing performance of *MACKLIN* M.M. Carbide Cutting Wheel goes far beyond highest expectations



Yes, sensational economies result from use of this revolutionary wheel. One user reports increased wheel life of 300% with a decrease in both wheel and labor costs. Another states that with equal wheel life the MACKLIN M.M. Wheel produced twice as many tools therefore cutting labor costs 50%. A third asserts grinding time was only 20% of usual with grinding costs reduced by 55%. Many report faster stock removal with grinding time greatly reduced and finishing costs cut up to 50%.

Call your Macklin distributor, or a Macklin field engineer, and let them prove how, you too, can get these cost and labor saving results.

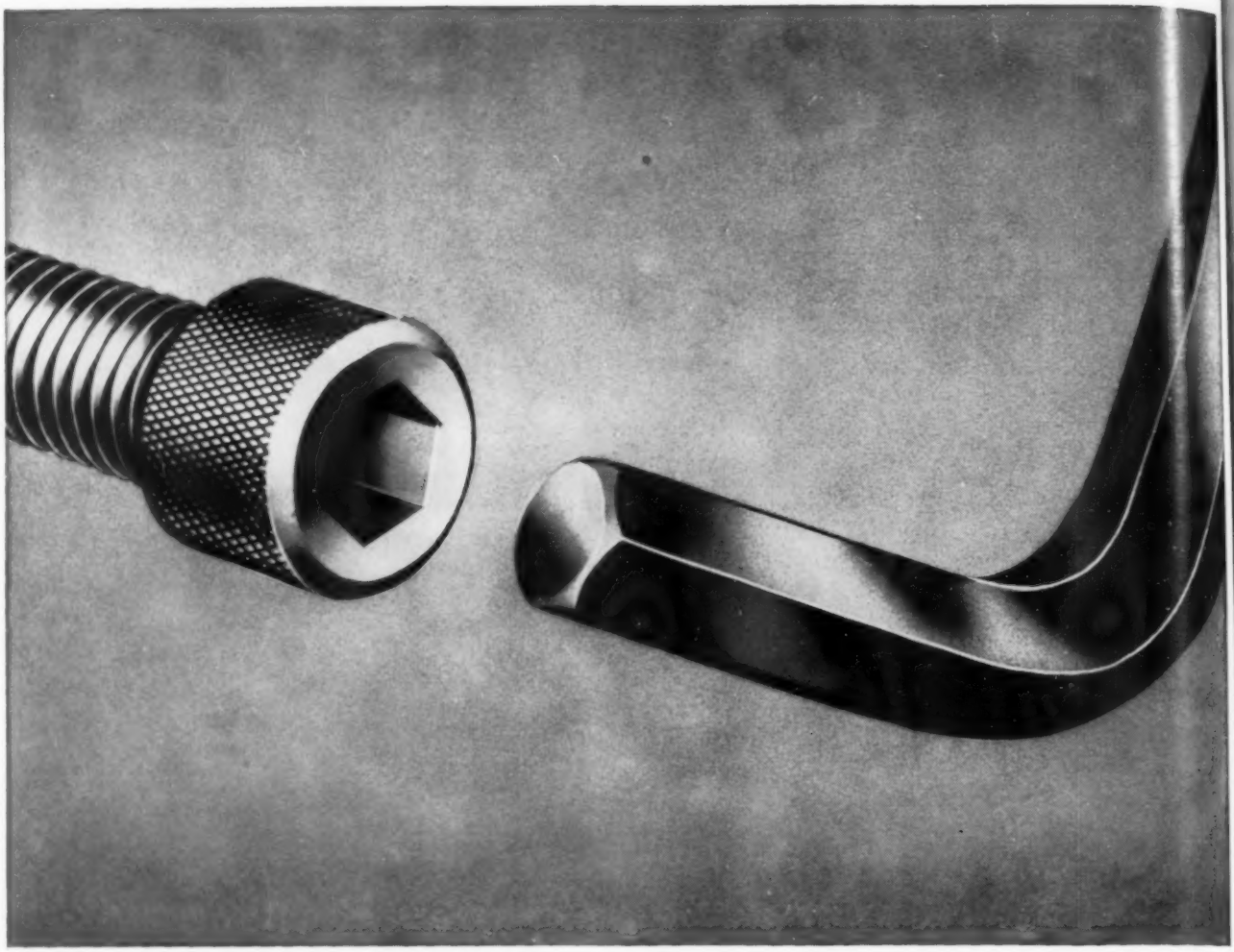
See this great wheel in operation at the A.S.T.E. Show — Booth No. 1409.

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS AND OTHER ABRASIVE PRODUCTS

JACKSON, MICHIGAN

Sales Offices - Birmingham - Buffalo - Chicago - Cincinnati - Cleveland - Columbus - Detroit - Flint - Houston Indianapolis - Los Angeles - Milwaukee - Moline - New York - Philadelphia - Pittsburgh - St. Louis



Bristol Hex Socket Cap Screws assure speedier, easier, tighter fastening

Bristol hex socket cap screws meet every production and maintenance requirement.

They spin easily into place, fit perfectly, and wrench up tightly, even in hard-to-get-at places. They take the wrench without skidding, too, so there's no danger of marring surfaces. Disassembly is just as easy. And Bristol's hex socket screws can be tightened far beyond the point where shock or vibration will loosen them.

This extra holding power results from the hex socket design, and Bristol's careful control over materials and manufacturing methods. Standard hex socket cap screws are made of alloy steel specially hardened. Other special metals and finishes may also be supplied. All Bristol screws are A.S.A. approved and precision threaded either National Coarse or National Fine.

Ask for Bristol hex socket cap or set screws in sizes from 0 wire to one inch in diameter at your industrial distributor's.

SEE OUR EXHIBIT IN BOOTH 1964 ASTE INDUSTRIAL EXPOSITION

BRISTOL'S SOCKET SCREWS

THE BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

ANNOUNCING THE NEW

Logan *P.R.O. CHUCK

Pat. 2617657

. . . Introducing a new and unrivaled factor for absolute safety never before attained

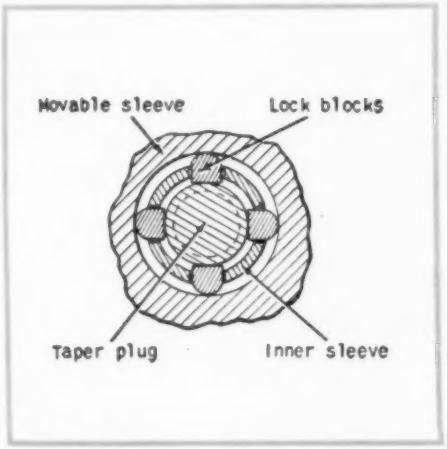
Don't let this happen to you

It Won't Let Go!

*Power Release Only

Neither centrifugal force nor power failure can cause release of the work as the Logan P.R.O. chuck is revolving on the machine spindle.

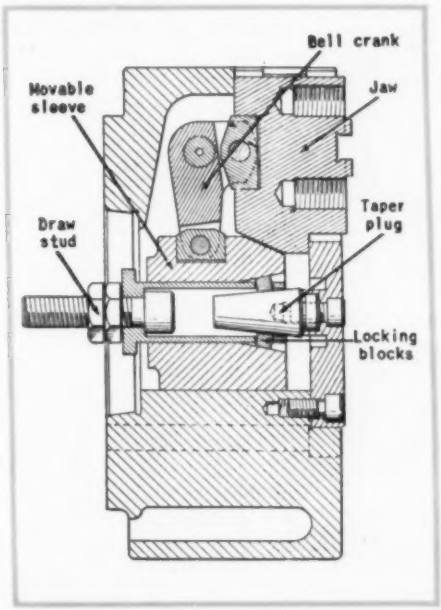
Thoroughly field-tested, this new P.R.O. chuck provides maximum holding safety.



The Logan locking feature is provided by the wedging action of these clamping blocks against unequal tapers on a sleeve and a tapered plug.

See It Operate at the A.S.T.E. Show

BOOTH 1550



Holding force on the Logan chuck jaws is produced by a set of bell cranks actuated by axial motion of a tapered sleeve.

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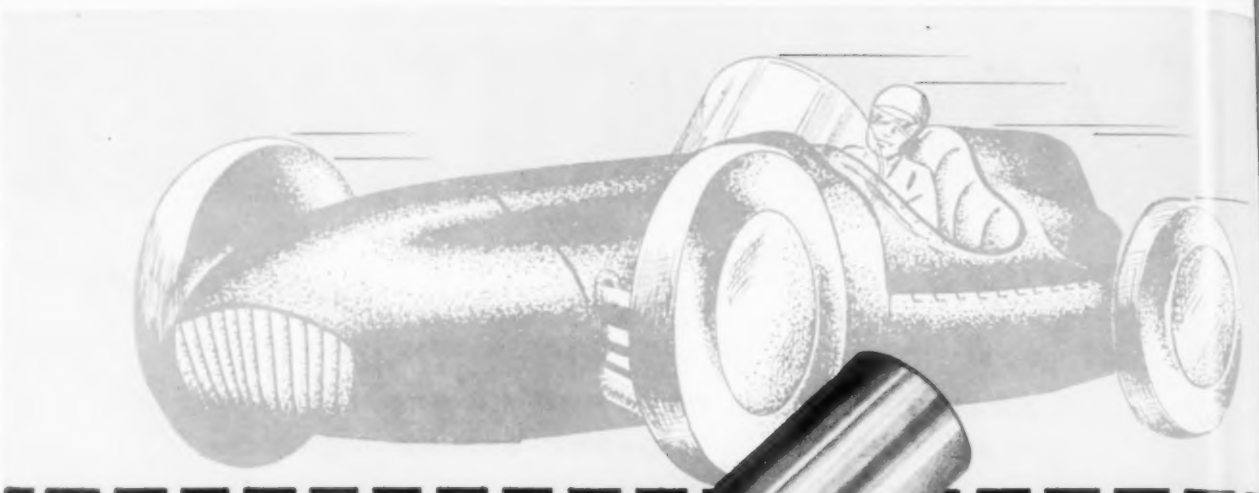
LOGANSPORT MACHINE CO., INC., 839 CENTER AVE., LOGANSPORT, IND.

SAVES TIME — Logan — AIR AND HYDRAULIC EQUIPMENT — EFFORT-MOTION

LOGAN . . . FLUID POWER SPECIALISTS SINCE 1916



R and L TAP AND DIE HOLDER

WHEN SECONDS COUNT

The R and L TAP AND DIE HOLDER readily changes from right to left due to the patented instant release action. It can also be adapted to work on short threads, do bottom tapping, or die up to shoulders.

Releasing or non-releasing, (also furnished for acorn dies), this tool is made in a complete range of sizes from ⅝" diameter shank to 1½" diameter shank.

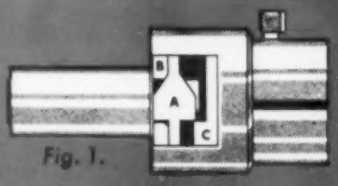


Fig. 1.

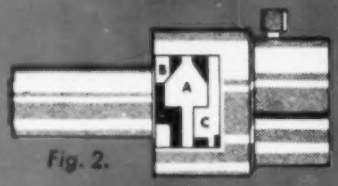


Fig. 2.

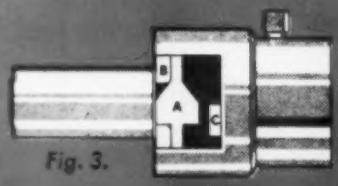


Fig. 3.

Fig. 1. Ready to start threading operation.

Fig. 2. Instantly engaged to full contact.

Fig. 3. Fully released. Note ample clearance between contact points of clutch.

Write for Catalog

RIGHT R and L LEFT TOOLS

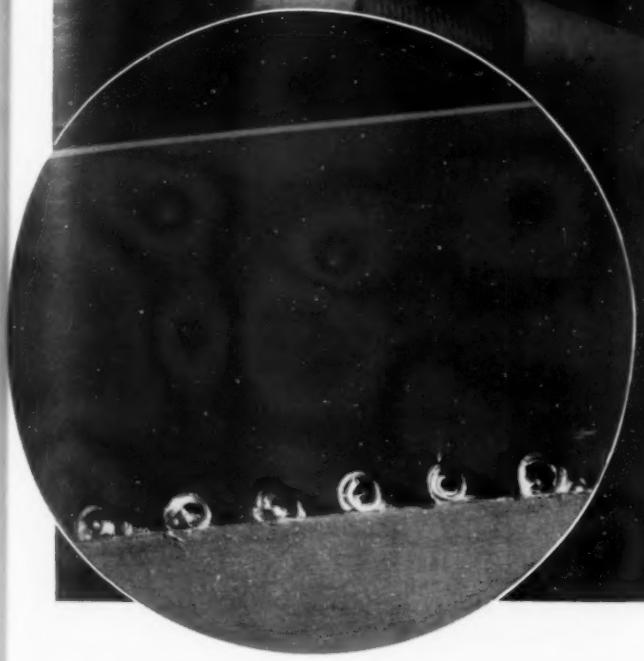
1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO AVAILABLE FOR ACORN DIES) • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

SEE R and L TOOLS AT BOOTH NO. 134, INDUSTRIAL EXPOSITION, PHILADELPHIA, APRIL 26-30

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-348

More Mileage Here



Starts Here with a SIMONDS "RED END" POWER HACK-SAW BLADE

What makes a "Red End" Blade cut better, last longer on the average than other blades? The answer's in the picture. Every "Red End" tooth takes exactly the same bite, curls the chip like a cutting tool on a lathe.

Because every tooth in every "Red End" Blade *is* exactly the same. It's all in the way we pour and roll our own steel . . . the way we mill the teeth to exact size and shape . . . set them evenly and accurately . . . and the special way we heat-treat them to a *uniform* hardness never believed possible before.

The result is *faster, straighter* cutting, and *many more* cuts per blade. If you haven't tried them yet—your local Industrial supply Distributor stocks 'em. Get some today and see.

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Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

There's a RED END Blade For Every Job

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HIGH SPEED WELD-EDGE — the SHATTERPROOF Blade for use where maximum safety is required.

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...at the flip of a single page

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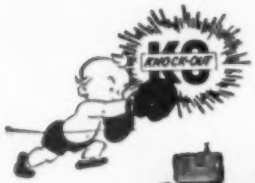
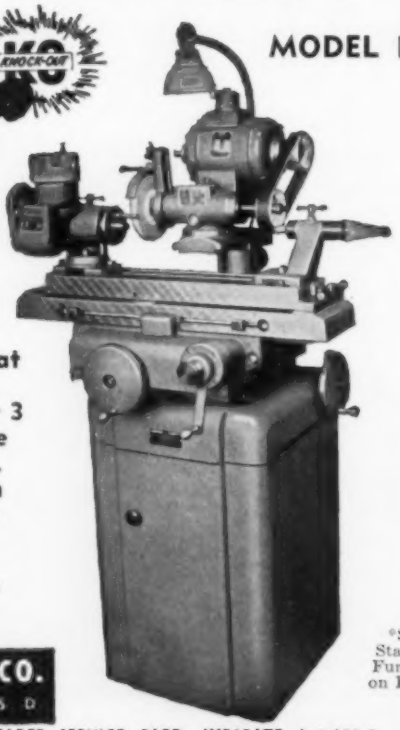
of all popularly-priced Tool and Cutter Grinders sold in 1952 were "Knock-Outs"



MODEL B860



Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

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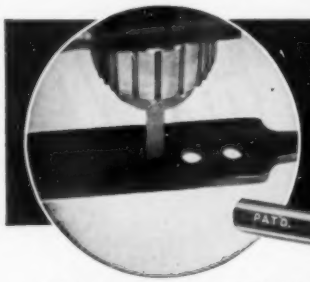

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

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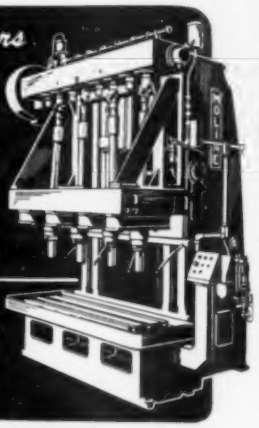
"HOLE-HOG"
Specially Designed
MACHINE TOOLS
Have Cut Production Costs for American Industry



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"Don't have FITS over FASTENERS, have fasteners that fit."

For the finest in milled-from-the-bar cap screws—set screws coupling bolts and milled studs

don't get stuck—stick to the ones made by

*Wm. H. Ottemiller Co. YORK, PENNA.

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technical magazines.

This machine hunts for—and finds—dead center!

This De Vlieg Jigmil is used to locate and bore the cylinder, gear-driven ink rollers, and gear bearing holes in ATF Chief frames.

Once the adjustments have been set, the Jigmil automatically positions every subsequent frame by moving its machine table or spindle head until the desired center is located to within 3-5/10,000ths of an inch. Then this 12-ton precision borer is micrometer-set so accurately that it will remove a pencil mark from a boring without cutting the metal.

Bearing holes not so accurately located on the press frame could easily throw cylinders out of parallel, cause excessive wear to precision gears, make smooth high-speed operation impossible and take years off the productive life of a press.

That's what we mean when we talk about the precision engineering that goes into an ATF Chief. You won't find more accurate borings in any press regardless of price. It's like getting Cadillac construction for Chevrolet prices.

It will pay you well, next time you're in the market for a small offset press, to ask for the full story on the precision-engineered ATF Chief. Write AMERICAN TYPE FOUNDERS, *a subsidiary of Daystrom, Inc.*, 200 Elmora Avenue, Elizabeth, New Jersey.

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New adaptable Morse Taper Shank and Adaptor Plug

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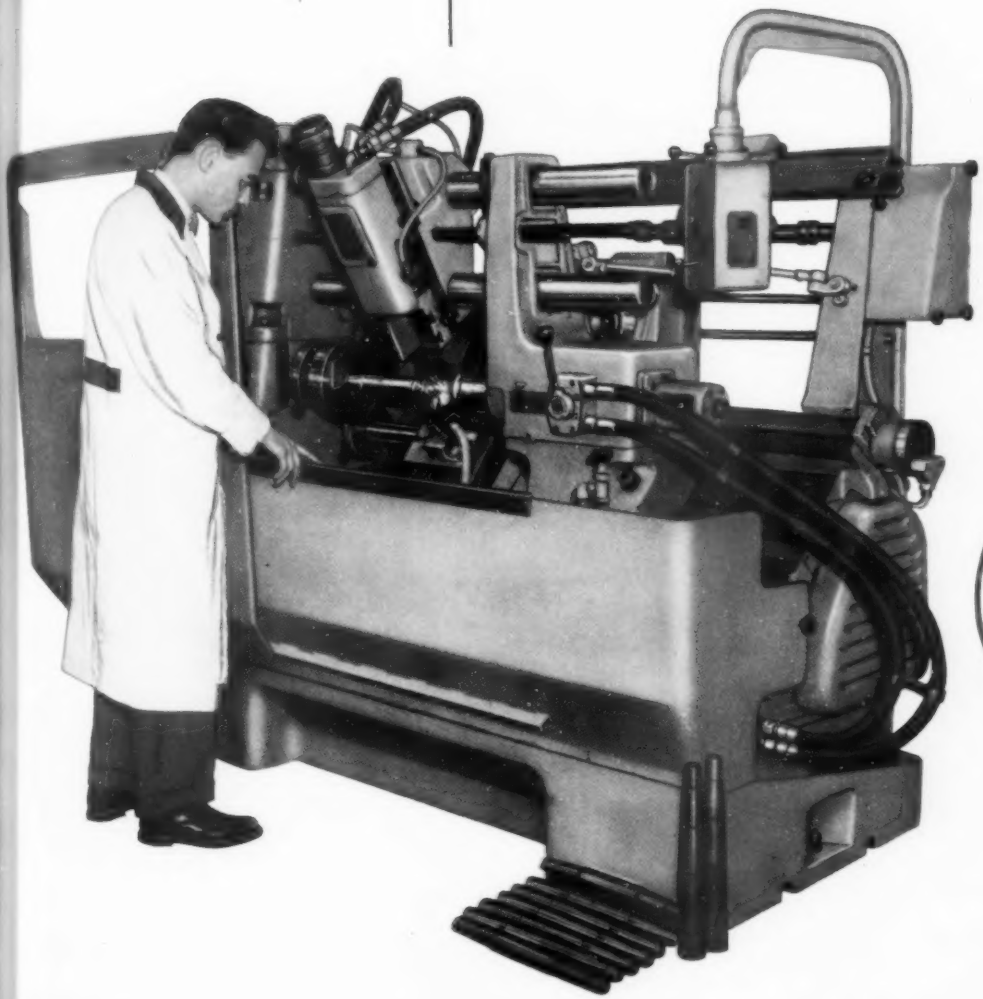
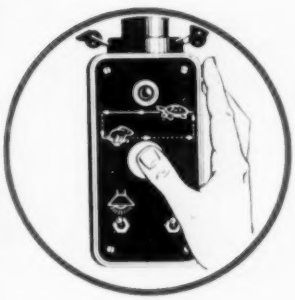
COMPLETELY AUTOMATIC

high speed **HYDRAULIC COPYING LATHE**



See its amazing speed at the **A.S.T.E. EXPOSITION** *in* **PHILADELPHIA,** *April 26-30, Booth 509*



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Turn the page to see the Pilot's outstanding features

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Progressive plants that demand the best say H.E.B. is "the way to turn"

See the H.E.B. Pilot in action at the A.S.T.E. Exposition in Philadelphia, April 26-30, Booth 5

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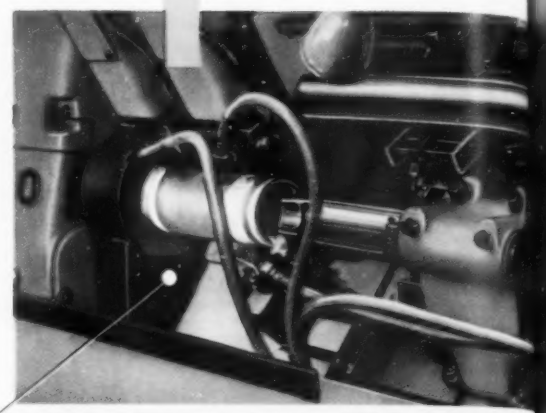

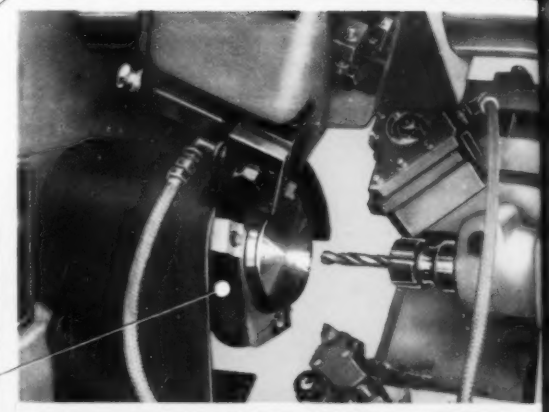

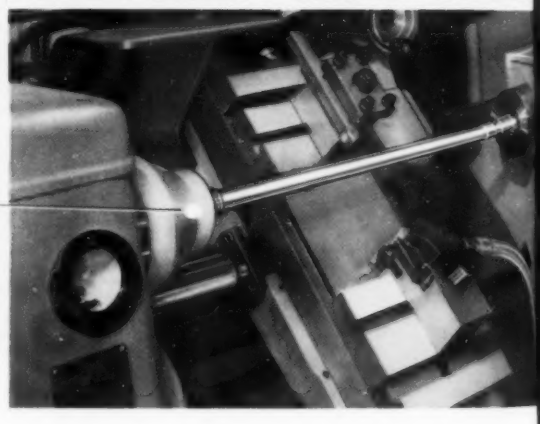

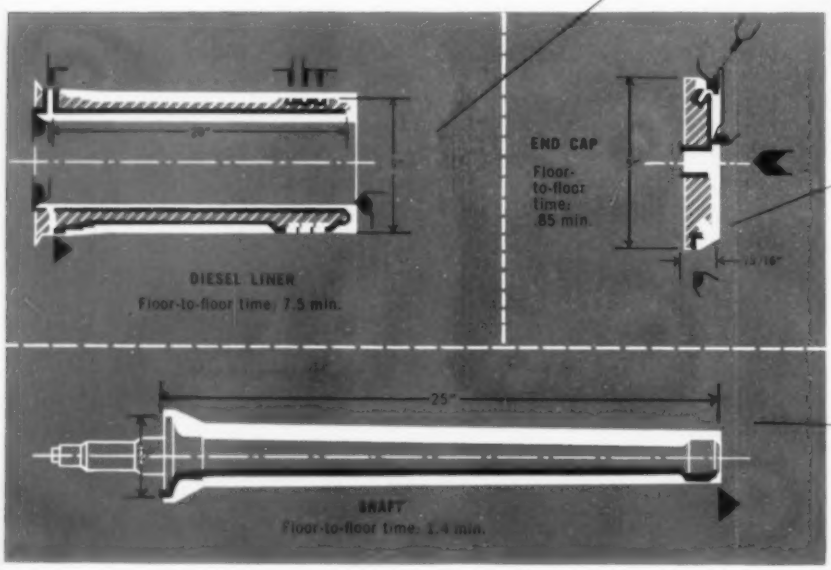

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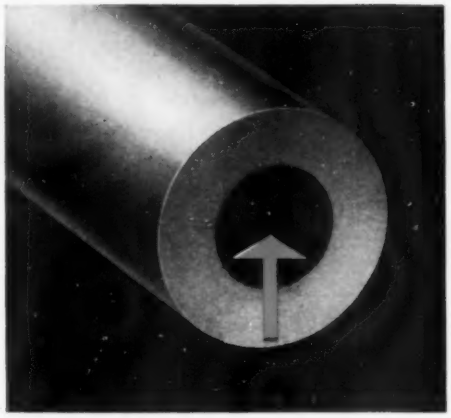

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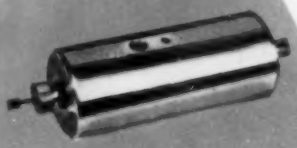

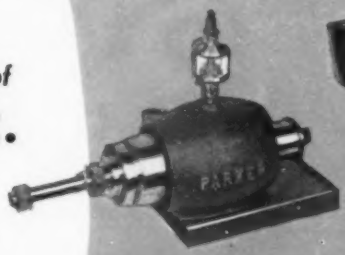

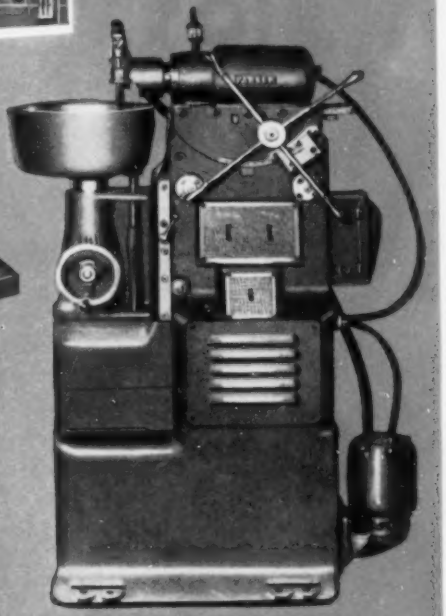

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Established in 1929, this company has for 25 years manufactured the **Parker** Spindles used in Precision Grinding, Boring and Milling applications. Additional products include the well known line of **Parker-Majestic** Internal, External, No. 2 Surface and Rotary Surface Grinders.

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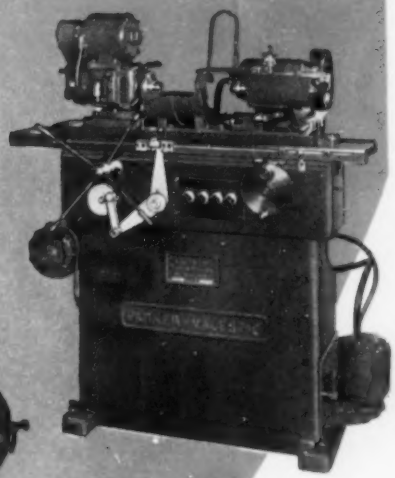

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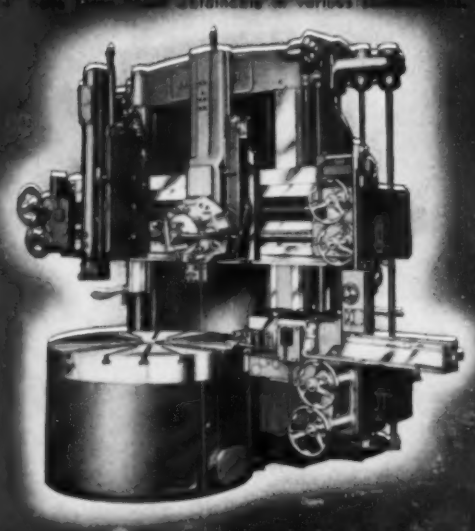
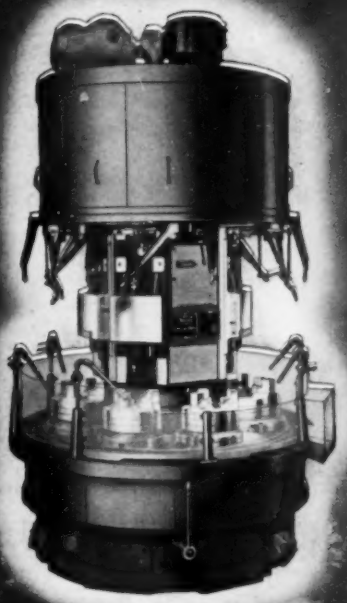
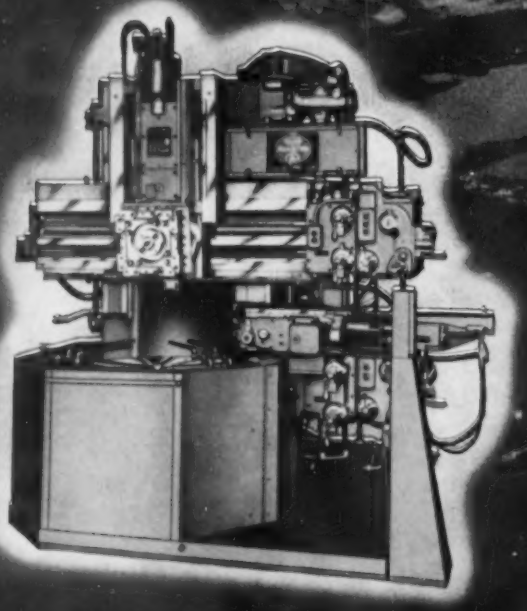
MULT-AU-MATIC

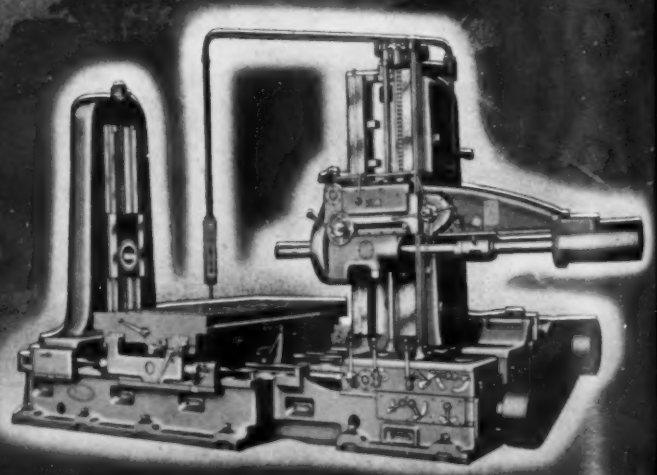
CUT MASTER V. T. L.



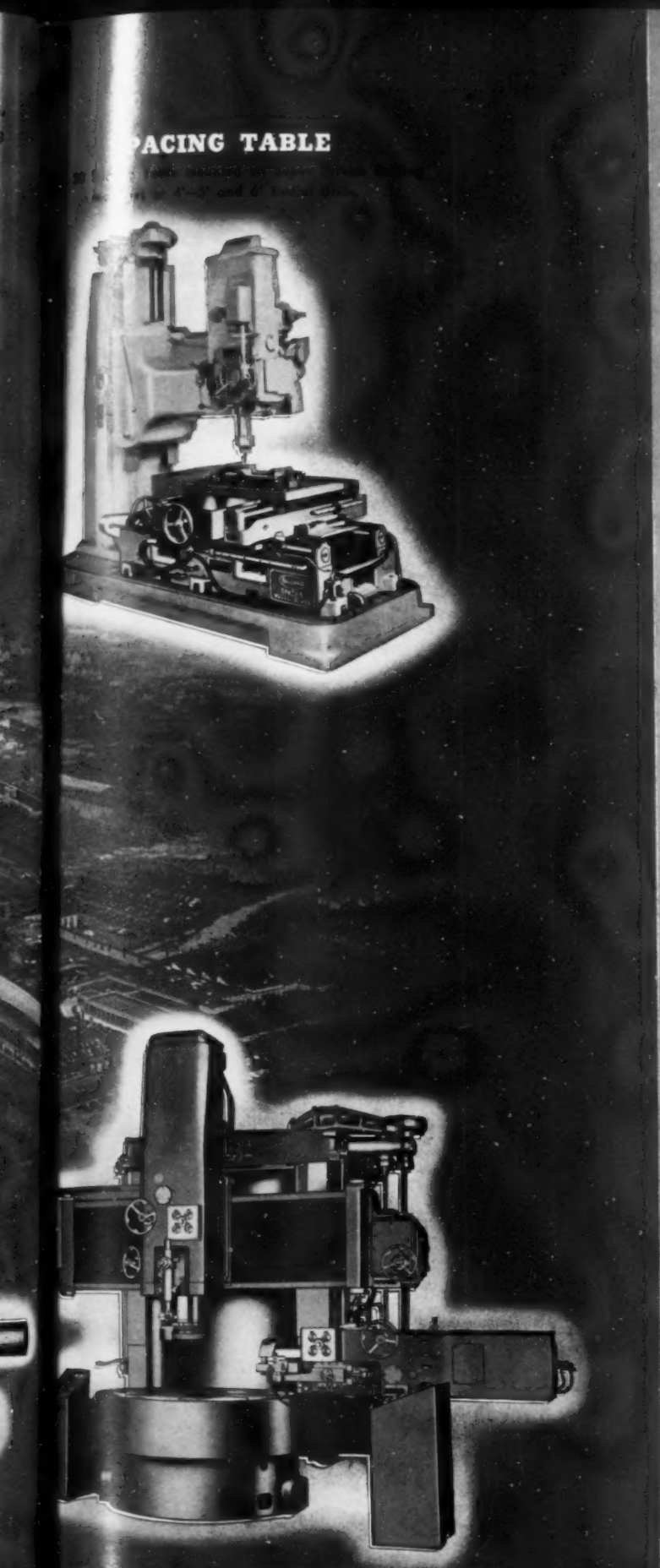




MAN-AU-TROL V. T. L.



HORIZONTAL BORING, MILLING AND DRILLING MACHINE



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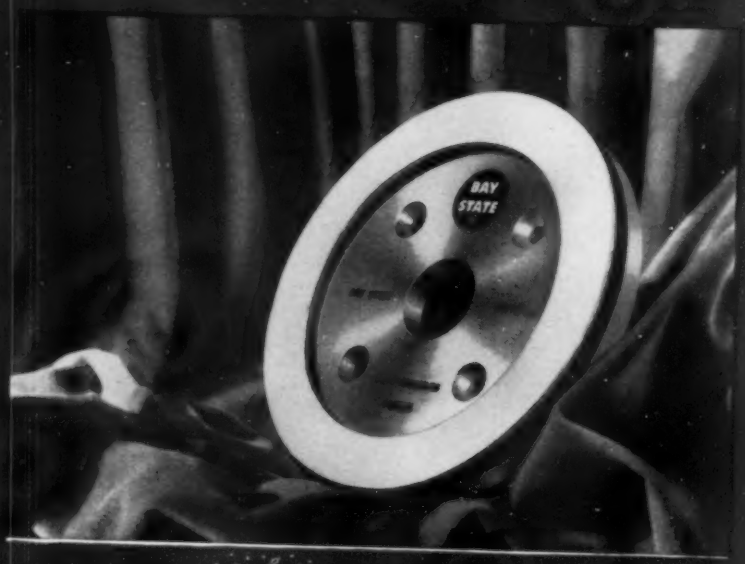

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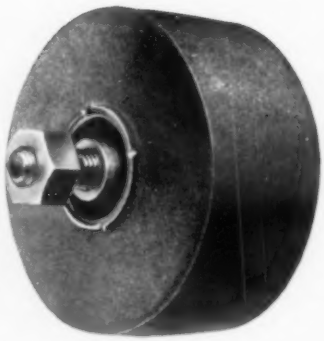
• • •

Neoprene Sponge

Wolverine Rubber Conveyor Rollers are made of an oil and abrasion resistant Neoprene sponge rubber, supported on dual ball bearings and mounted with a standard ½" bolt and nut assembly.



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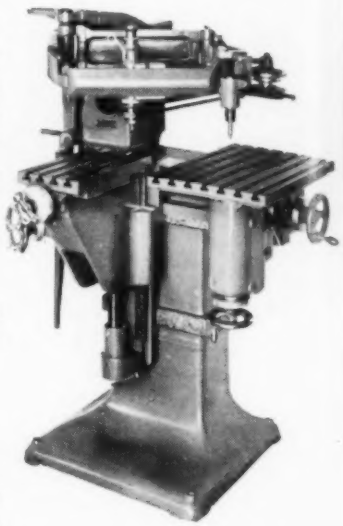

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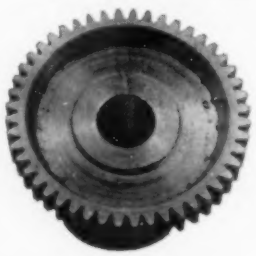
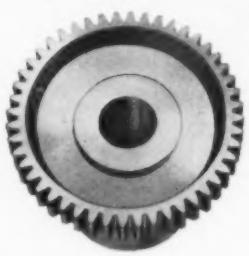


BEFORE PRESSURE-BLASTING



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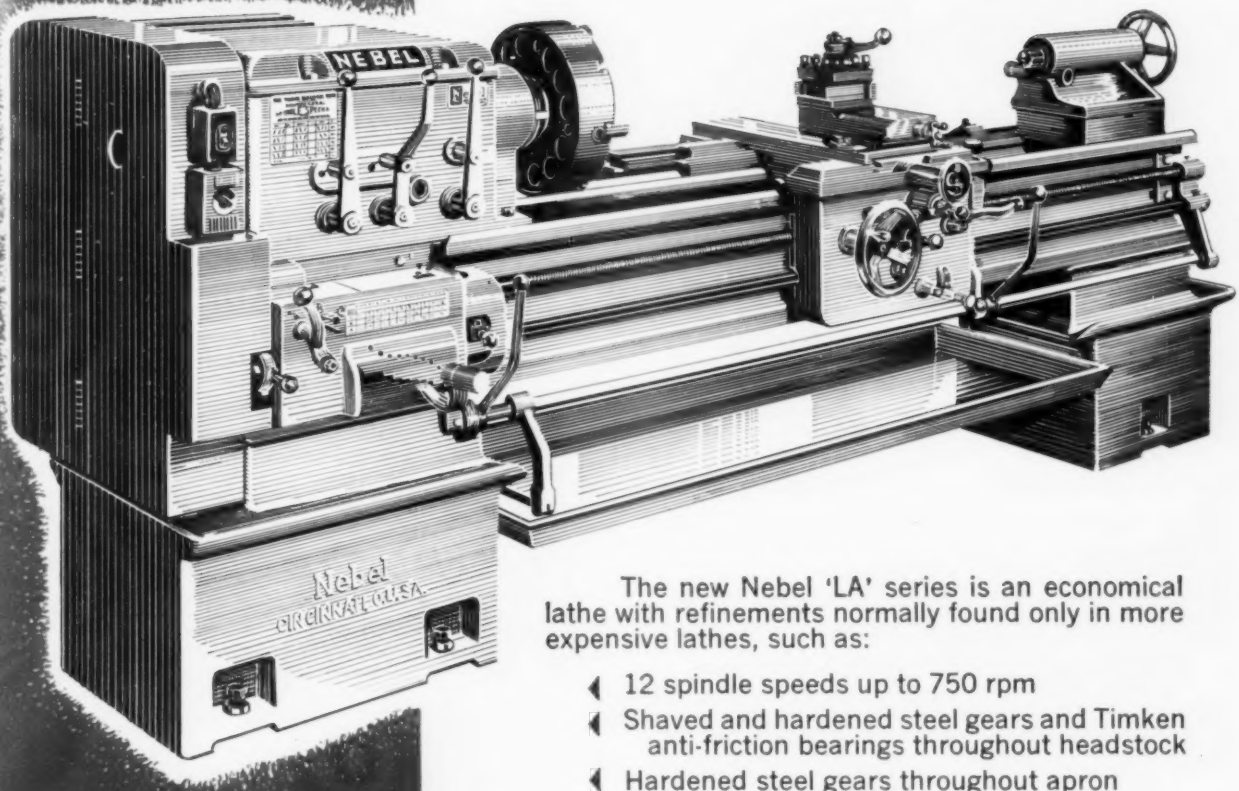
Get all 4 with the new 16" Nebel 'LA' series engine lathe



The new Nebel 'LA' series is an economical lathe with refinements normally found only in more expensive lathes, such as:

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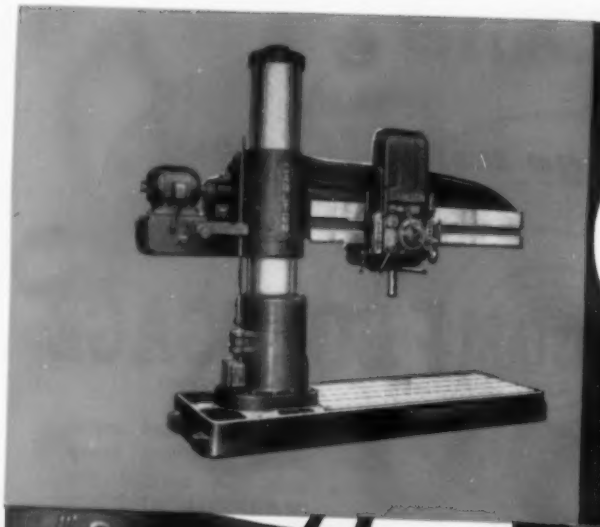
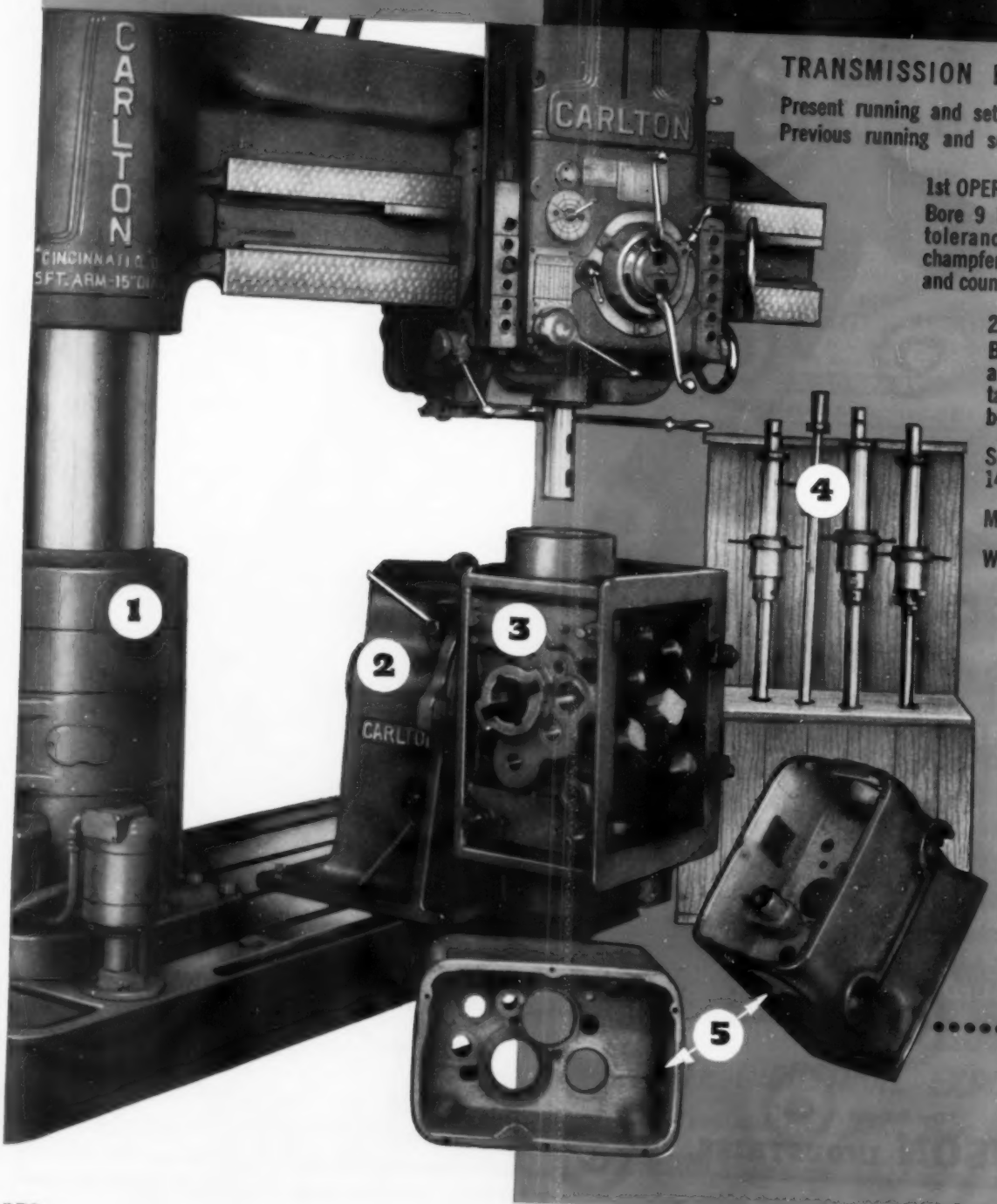
the men with the holes in their heads



Carlton



TRANSMISSION BODY CASTI

Present running and set-up time: 5.25 ho
Previous running and set-up time: 7 ho

1st OPERATION:
Bore 9 holes to ± .000
tolerances, counterbore a
champfer . . . drill, tap, re
and counterbore 41 holes.

2nd OPERATION:
Bore 4 holes to tol
ances ± .0003", dri
tap, ream and count
bore 11 holes.

Size:
14" x 13" x 20¾"

Material: Semi-steel

Weight: 250 lbs.

THE PRODUCTION RADIAL DRILL

Carlton radial drills, properly tooled, will lower costs over the horizontal method

Drilling and boring accurately located holes isn't usually considered a production operation for a radial drill. However, when fitted with master trunnion and appropriate jigs, Carlton radial drills do this work accurately, quickly *and on a production basis!*

The transmission body shown here is a perfect example of production hole drilling on a Carlton. Using this set-up, many more operations are performed in the Carlton radial drill . . . at a terrific saving in handling and running time over the previous method.

Previously the transmission body was processed with the horizontal boring method included. The new tooling set-up worked out by Carlton engineers effected a 25% savings by circumventing the boring operation previously done in a horizontal plane. Using the horizontal method, the transmission body had to be handled four times . . . now it's handled but twice!

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Carlton

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1. Carlton 3-A radial drill
2. Master trunnion
3. Jig
4. Boring bars
5. Transmission body casting

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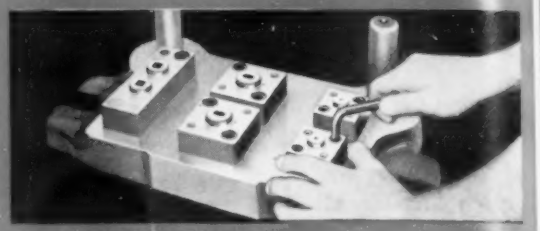
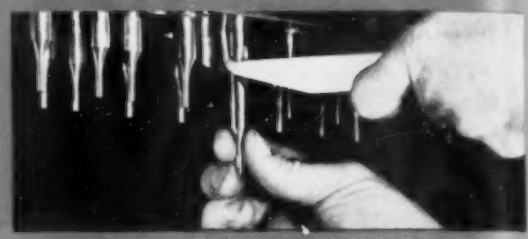
WHERE R-B Punches cut your costs

in die designing



in die construction



in die operation

IN DIE DESIGNING

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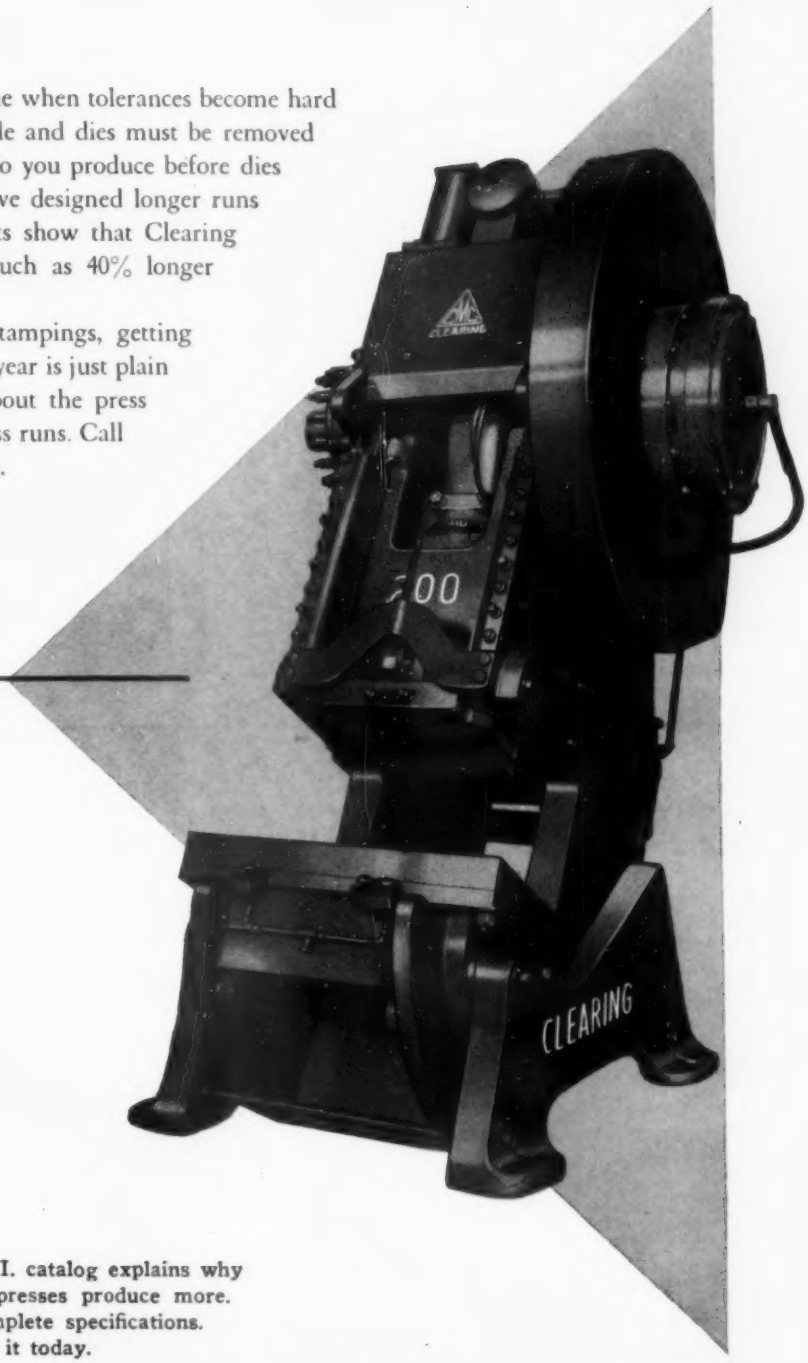

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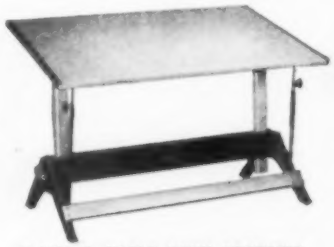

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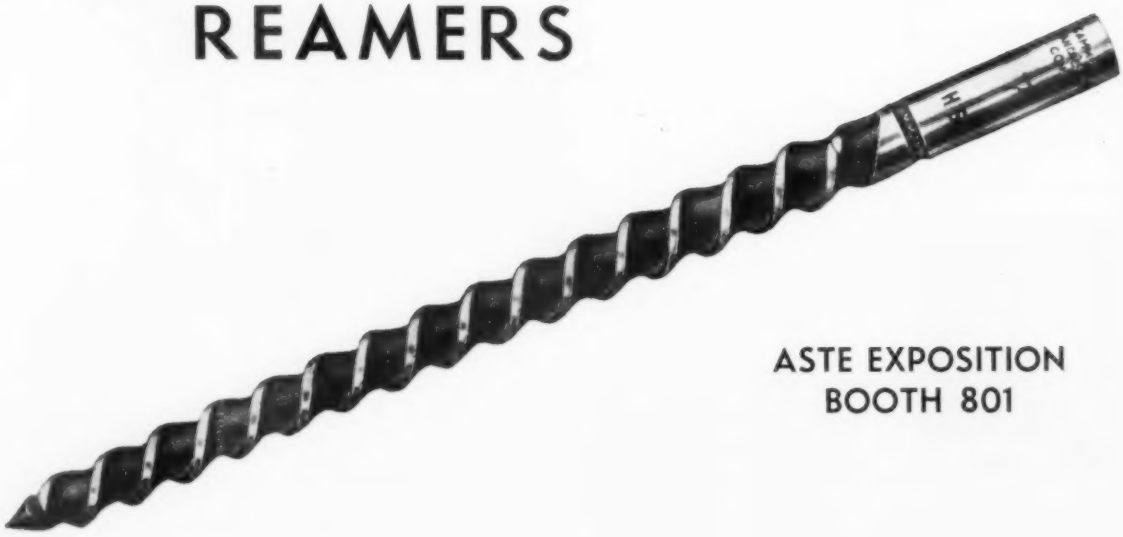

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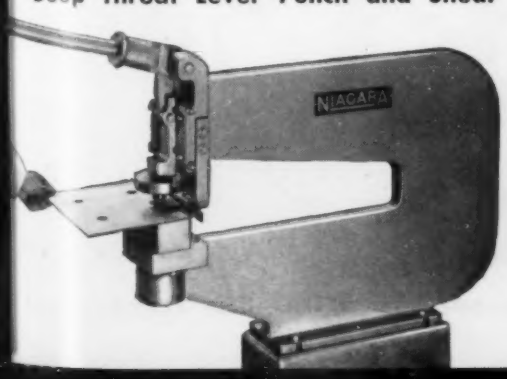

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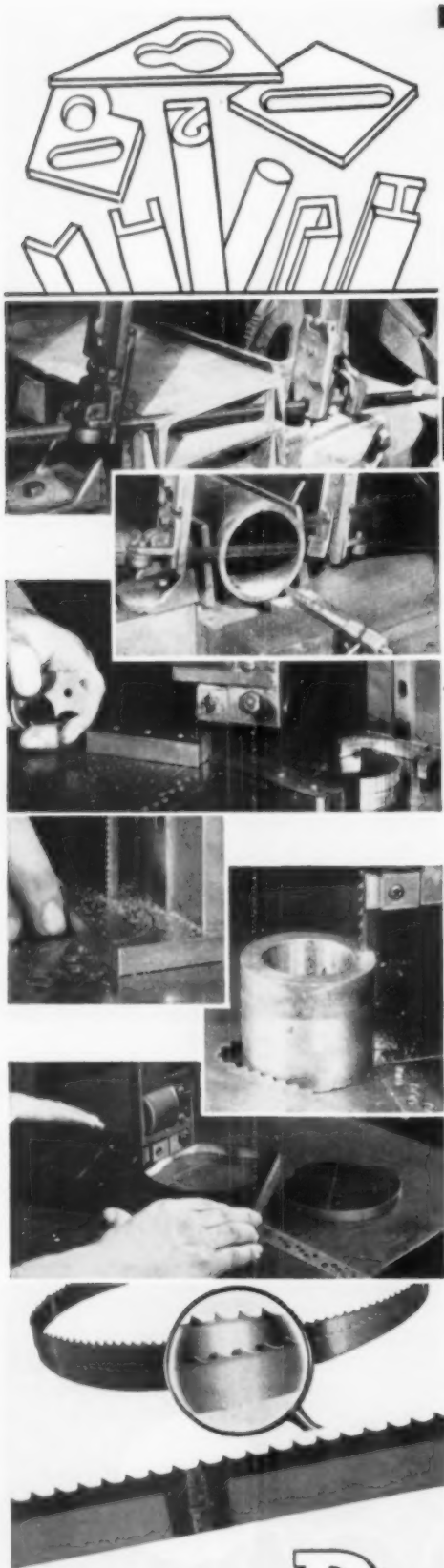

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SAFE CONVENIENT PACKAGING!

DETROIT BARNES USA

FAMOUS FOR QUALITY

Barnes **ARC-LINE** - Raker and Wavy set and Barnes SKIP TOOTH provide users with blades for every type of metal cutting. Ask your distributor for Barnes Band Saws.

Barnes welded band saws save operation time and eliminate waste blade stock. They are tailor made for your machines. Barnes "perfect" welds on superior blades adds up to more cutting at less cost.

Barnes Handbook on metal sawing is profusely illustrated and packed with metal cutting information. Get your copy today from your Barnes Distributor or write us.

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W. O. Barnes CO., INC.

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How to solve 39 PRODUCTION PROBLEMS with Mead Air Devices

SEE how to use standard Mead units to make automatic or semi-automatic machines!

New 16-page Mead PHOTO-BOOKLET presents actual examples in pictures and text of 39 different, tough production problems solved by various combinations of Mead Air Operated Devices. This interesting booklet shows how to:

(1) De-burr small parts fast (2) Press 3 components together (3) Tap die cast knobs (4) Insert rubber discs into metal cups for insecticide "bombs" (5) Swage hubs to hypodermic needles (6) Ream center hole in valve plate (7) Broach 2 internal slots in brass valve inserts, handling 4 sizes (8) Press filters into copper shells and indent dimple in shell (9) Tap 2 holes ⅛ in brass brush holders. (10) Drill and tap a 1/4–20 hole 9.16 deep then ream "bell-mouth" in stainless steel forging (11) Drill and ream a hole to controlled depth in brass valve body. (12) Drill No. 52 hole thru end of solid graphite pencil. (13) Press plastic liners into perfume bottle caps (14) Drill cast iron gas burners (15) Drill ¼ hole thru steel axle of fishing reel (16) Carry copper rods thru series of gas flames to braze special tips to lower ends. (17) Chamfer hole in spark-plug bodies approx. 3,600 per hour (18) Swage steel ball into brass nose of ballpoint pen approx. 3,600 per hour (19) Assemble patented brass couplings and flare neck into nut to simultaneously form fluid-tight seat (20) Drill twin holes in chain-saw teeth (21) Counter sink both sides small washers, wheels, rollers approx. 4,000 per hour. (22) Press shafts, bushings into plastic knobs (23) Drill and tap 5-40 threads in rectangular brass electric terminals, approx. 2,400 per hour (24) Crimp together 2 thin spring members of pen assembly (25) Press brass shells over cast iron cores of doorknob assemblies (26) Crimp saddles to plastic radio tube sockets (27) Stamp trademark on brass plugs approx. 3,600 to 4,000 per hour (28) Press ferrules on wood handles (29) Assemble paper hangers' tool roller to yoke by inserting pin thru collar (30) Feed, spin finials onto screw of lamp shade holder (31) Crimp eyelet and ring on pen barrel (32) Drill and tap 2 holes 8-32 in aluminum BX connectors (33) Drill ⅛ hole in aluminum part, chamfer both top and bottom of hole, approx. 2,000 per hour (34) Cap cathode tubes for TV sets at 3,200 per hour (35) Fill pen tubes with ink, insert ball point assembly at one pass (36) Bend precut copper tubes 90° at 4,000 per hour (37) Drill 2 holes in brass castings, fed to 2-spindle drill head (38) Hold plastic bead, drill hole, eject (39) Drill bushing for 2 size clevis pins.

TEAR OUT MEMO COUPON FOR YOUR COPY!

SEE MEAD AIR POWER IN ACTION AT THE A.S.T.E. SHOW, BOOTH 1907, APRIL 26-30, PHILADELPHIA!

Memo Coupon

MEAD SPECIALTIES CO.
4114 N. Knox Ave., DEPT. T-44, Chicago 41, Illinois

Send new MEAD PHOTO BOOKLET "Air Power At Work" specially printed in green and black.

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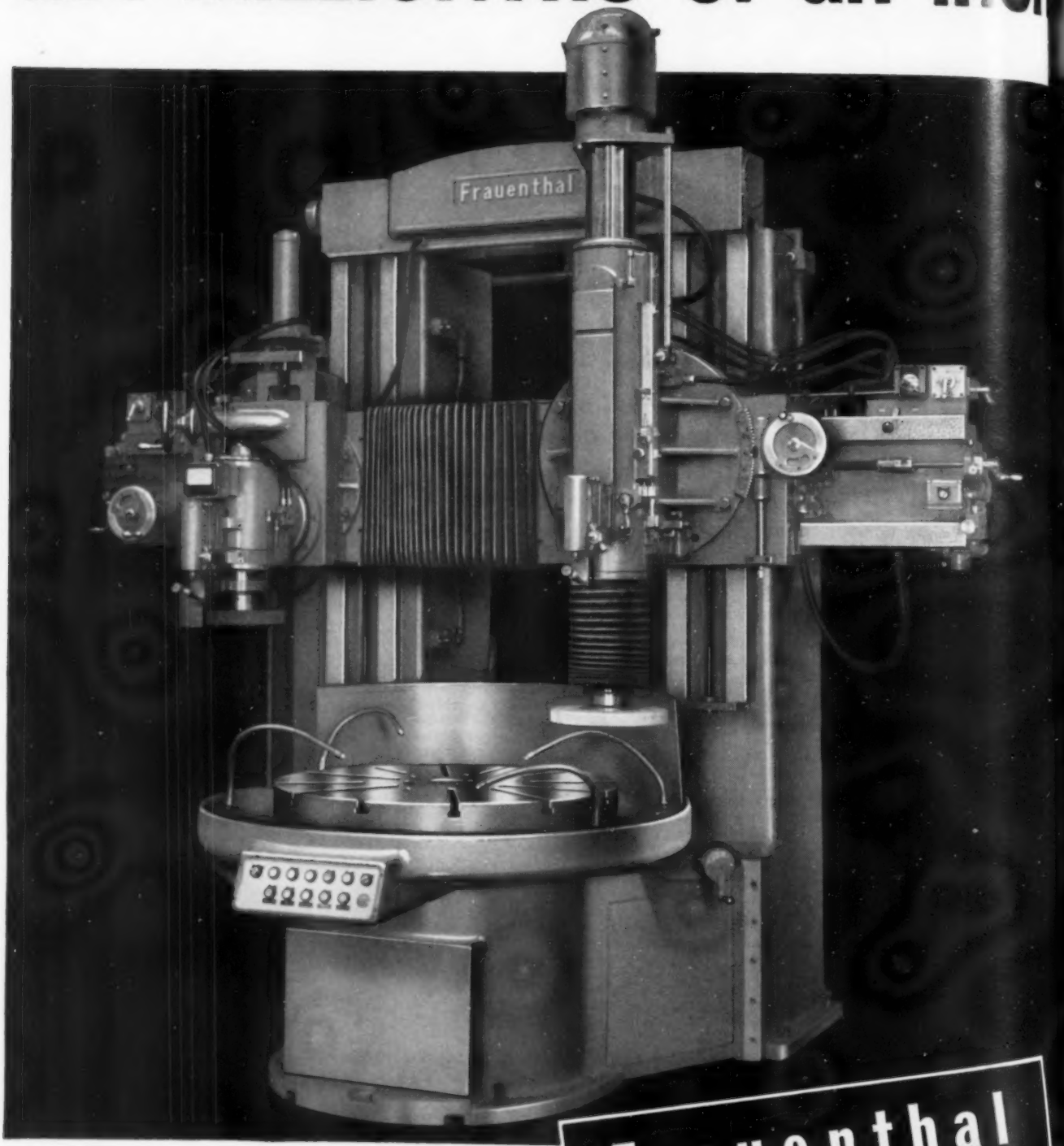
Get MILLIONTHS of an inch



This 1800 Series Frauenthal Grinder was specially engineered with direct-connected spindle and quill-type spindle (25" stroke) for fast precision-grinding of vital aircraft engine parts to millionths-of-an-inch tolerance.

Frauenthal Grinders

MULTIPLE-HEAD SUPER-PRECISION CYLINDRICAL

PRECISION-GRIND INSIDE, OUTSIDE AND FACES SIMULTANEOUSLY TO MILLIONTHS OF AN INCH!

PRECISION at low cost with Frauenthal Grinders

Grind to "AIRCRAFT Precision"... faster!

On all of your own toolroom and production grinding, you can get the super-precision demanded in grinding the most accurate aircraft parts by using Frauenthal "millionths-of-an-inch" grinders. Through more than a decade these grinders have been performance-proved on the toughest precision jobs . . . grinding parts for aircraft, jet and automotive engines; tanks; gunmounts; radar units; Diesel connecting rods; plug valves; large diameter high precision bearings and other industrial and military parts and assemblies, consistently, to *fractions of ten-thousandths,* best expressed in *millionths* of an inch!

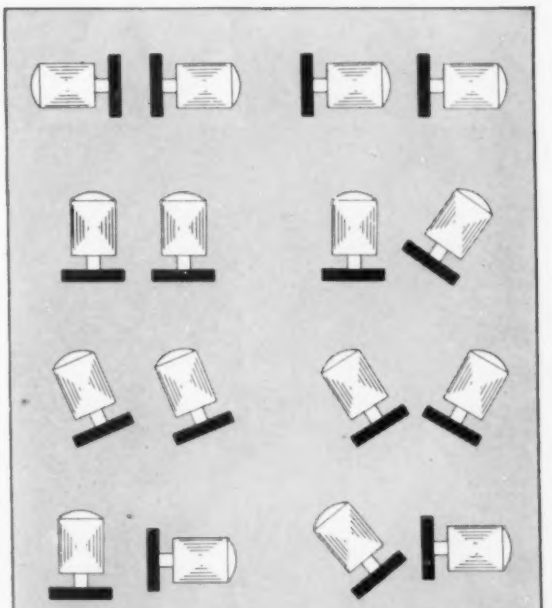
Save time and money by SIMULTANEOUS grinding of inside and outside diameters or faces

With Frauenthal Multiple-Head Cylindrical Grinders you save important time and lots of money because *simultaneous* grinding of *related surfaces* assures utmost precision and unfailing interchangeability of parts. Adaptations for super-precision boring or turning also can be engineered into these grinders for specific jobs.

What's YOUR Grinding problem?

Tell us, in confidence, what you want to grind. Frauenthal Grinders permit many combinations of grinding-spindle positions for a wide variety of simultaneous grindings of outside and inside diameters or faces. Large diameters can be ground to the extremely close tolerance of .000200" (200-millionths of an inch) *or better,* with assurance of uniform precision in concentricity, parallelism and roundness. Valuable details on request. We'll be glad to work with you on difficult grinding, boring, turning problems.

Many combinations of spindle positions for simultaneous grinding on all sizes of Frauenthal grinders



TEN STANDARD SIZES conforming to essential J.I.C. specifications

SERIES	TABLE SIZES	MAXIMUM SWING
1800	30"	60"
	36"	60"
	42"	60"
	48"	60"
2000	60"	72"
	72"	88"
2200	110"	120"
	120"	130"
	130"	140"
	140"	150"

WRITE FOR BULLETIN

Frauenthal Division

THE KAYDON ENGINEERING CORP. • MUSKEGON, MICHIGAN

Accurate Die Alignment Reduced Die Maintenance

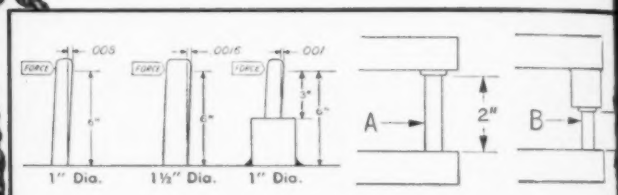
with

SUPERIOR N-K* DIE SETS

*Developed in conjunction with Nock Kelvinator Die sleeves and now incorporated 100% on all Nock Kelvinator Die Sets.

OVERCOME FORCES THAT CAUSE A DIE TO SHEA ITSELF, CHIP ITS CUTTING EDGES, BREAK PUNCHE PRODUCE IRREGULAR BREAK LINES, AND CAUSE LARG AND IRREGULAR BURRS ON THE PARTS PRODUCE

Superior N-K Die Sets incorporate welded boss around pins or bushings to increase the accuracy a durability of the die set. These welded bosses short the unsupported pin length which in turn great reduces pin deflection. Misalignment caused by pre irregularities, irregular forces and thrusts within t die itself are minimized, because N-K Die sets brin the pivot point down to or below the cutting plan



With the same amount of side thrust A is deflected 8 *times* more than B. The above illustrations show how welded bosses on Superior N-K Die Sets greatly decrease the amount of pin deflection.

Write, phone or wire to for complete FREE infor tion, on Superior N-K Sets.

5 TON
SUPERIOR
N-K DIE SET

SUPERIOR STEEL PRODUCTS CORP.
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SEE SUPERIOR DIE SETS & SUPPLIE ON DISPLAY IN

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America's Most Complete Line of Industrial Small Tools

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PHILADELPHIA CONVENTION CENTER
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featuring...

precision products that make possible the most efficient and economical production of accurate work

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-381

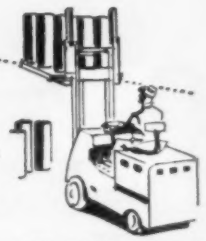
WHERE'S THE LIMIT TO WHAT YOU CAN DO WITH

Hydraulic Power?

IMPROVE PRODUCT PERFORMANCE

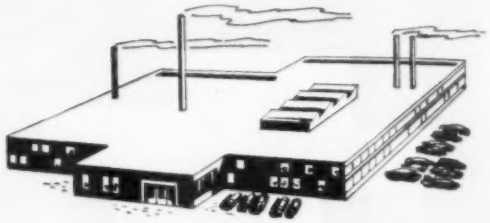
BROADEN PRODUCT USEFULNESS

AID CUSTOMER CONVENIENCE



CUT LABOR COSTS

—and boost productivity in your plant!

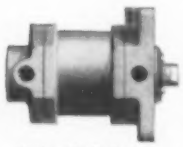


Hydraulic power has benefited hundreds of products and can help countless more. But NONE so much as the machinery in your own plant! For hydraulics applied to machine set-ups and operations can cut your costs substantially and increase output.

Why pay for labor over and over and over?—when hydraulics can replace manual effort on forming, handling, machining, finishing, and other operations; and do a faster, better job with less chance for error.

Invite your local Rivett Representative to visit your plant—study your processing—and make recommendations. He'll lower your costs and put you in a far better competitive position.

RIVETT FURNISHES A COMPLETE LINE OF AIR AND HYDRAULICS— CAN PROVIDE ANY REQUIRED CIRCUIT FOR ANY TYPE APPLICATION!



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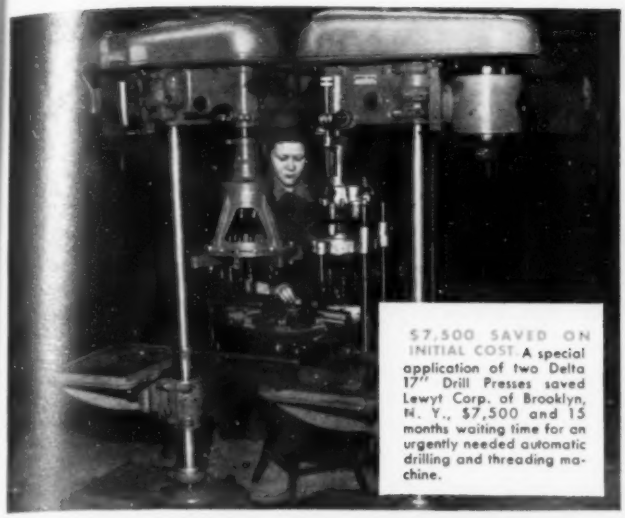
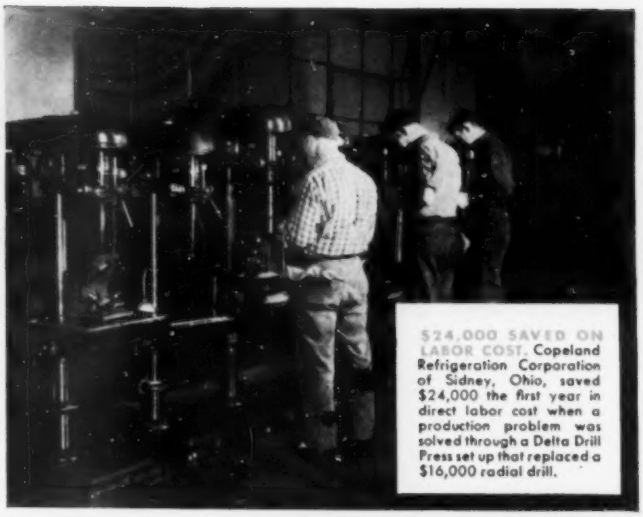
Air and Hydraulic Valves and Cylinders, Hydraulic Power Units.

Visit Booth 1854 ASTE Show April 26-30th

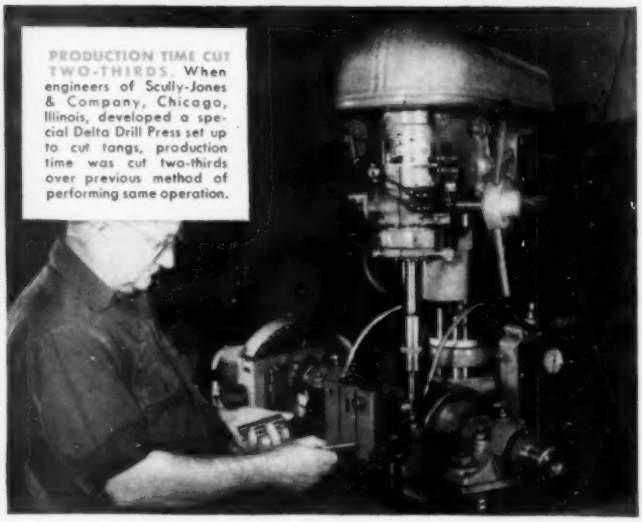


$7,500 SAVED ON INITIAL COST. A special application of two Delta 17" Drill Presses saved Lewyt Corp. of Brooklyn, N. Y., $7,500 and 15 months waiting time for an urgently needed automatic drilling and threading machine.



$24,000 SAVED ON LABOR COST. Copeland Refrigeration Corporation of Sidney, Ohio, saved $24,000 the first year in direct labor cost when a production problem was solved through a Delta Drill Press set up that replaced a $16,000 radial drill.

MATERIAL HANDLING COSTS SLASHED. Sangamo Electric Company, Springfield, Illinois, eliminated costly trucking and handling through use of Delta sectional table drill press set ups, with operator moving from one machine to another.



PRODUCTION TIME CUT TWO-THIRDS. When engineers of Scully-Jones & Company, Chicago, Illinois, developed a special Delta Drill Press set up to cut tangs, production time was cut two-thirds over previous method of performing same operation.

Four Basic Problems: ONE SENSIBLE ANSWER

(Rockwell-built DELTA Power Tools can be your answer to rising costs, too!)

If your profits are being squeezed between rising costs and stiffening competition, do what other progressive businessmen are doing. Use low-cost Delta Power Tools to supplement—and sometimes replace—heavy, expensive conventional machine tools.

Rockwell-built Delta Power Tools make possible big savings in labor, time, and material handling costs because they are so easy to move into and out of production lines, and set up in special combinations. They work to extremely close tolerances, and *stay* accurate, require a minimum of maintenance. Parts are quickly available. And Delta Power Tools are so inexpensive that they make money for their owners *even when standing idle*. They can be *kept* tooled up, saving costly set-up time.

The growing trend toward low-cost, portable, accurate Delta Power Tools amounts to virtually a "new industrial revolution"—a new kind of production thinking that is cutting costs in plant after plant. Your Delta dealer can help you cut *your* costs, too—he's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY." *Delta Power Tool Division, Rockwell Manufacturing Company, 620D N. Lexington Ave., Pittsburgh 8, Pa.*

DELTA QUALITY MAKES THE DIFFERENCE

ROCKWELL

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

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How GREENLEE uses ne

Powerful Scully-Jones "Roll-Lock" tools permit faster, more accurate chucking!

This Greenlee Transfer Unit is equipped with 16 Scully-Jones "Roll-Lock" Tool Chucks, which provide a completely different, advanced method for holding and driving reamers.

Taking advantage of the elastic properties of metal, "Roll-Lock" Chucks compress evenly and powerfully on the shank of the tool . . . provide an accurate, centering *shrink-fit* free of all clearance or play. Actuation and release are fast and easy. Operator merely twists the actuating ring (only rolling friction has to be overcome) to produce the powerful "Roll-Lock" wedging action on the tapered chuck body. There are no accessory tools or time-wasting operations. Positive, rigid holding permits use of heavier feeds and speeds.

Accurate chucking . . . often within .0001" T.I.R. . . . improves finish and accuracy, prolongs tool life by eliminating vibration and runout. Standard or special "Roll-Lock" Arbors, Mandrels, and Chucks, for internal or external chucking of parts or tools, will increase profits on a wide variety of your production machining and inspection operations. Call your nearby Scully-Jones representative or distributor—factory-trained "Precision Tool and Work Holding Specialist"—for complete information and service.

"Roll-Lock" Flange Type Expanding Arbor

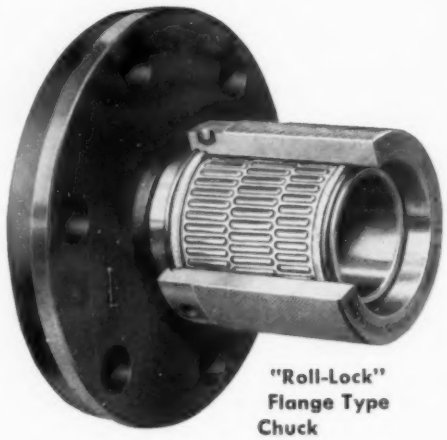
Reduce loading, unloading or setup time—Simple, quick method of chucking to a shrink fit eliminates tapered mandrels, hammering, lead plates, and arbor presses.

Speed turning and grinding operations—Rigid, powerful holding action permits transmission of torque and thrust required for heavy feeds and high speeds.

Improve work finish and reduce rejects—Provide chucking accuracy difficult to obtain by any other method.

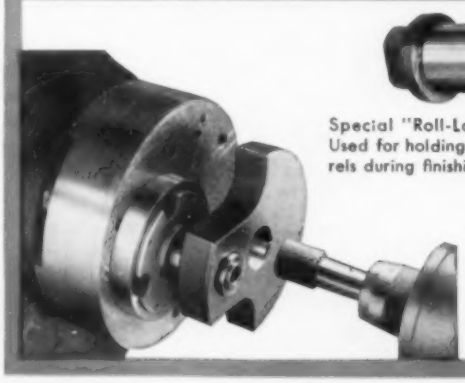
Simplify and speed operation—Workpieces always easy to load in same position due to simple, accurate method of locating and chucking.

Testing for runout made easy—Equal force evenly applied around chucking surface, accurately centering the piece being tested.



"Roll-Lock" Flange Type Chuck

FOR PRECISION WORK AND TOOL HOLDING

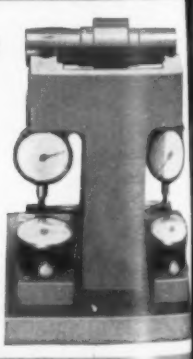


Special "Roll-Lock" Centering Plug. Used for holding and driving gun barrels during finishing operations.

Use them on turning, grinding, sharpening, drilling, boring, reaming, counterboring, shaving, and lapping operations.

FOR GAGING AND INSPECTION OPERATIONS

Special "Roll-Lock" Mandrel for use in gaging fixture for aircraft engine parts.

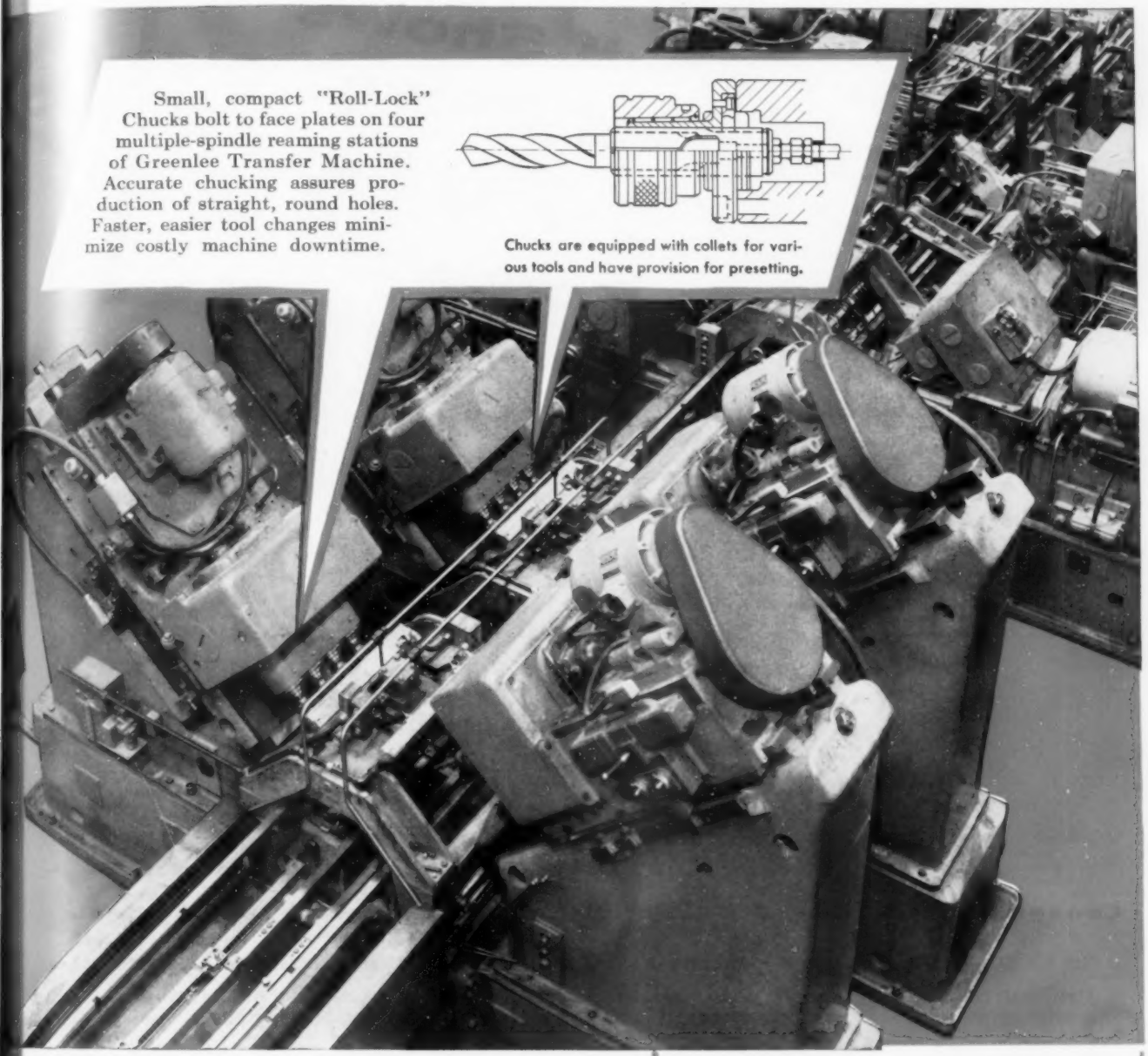


Special "Roll-Lock" Test Mandrel setup for gaging runout on connecting rods.

...vest chuck development

Small, compact "Roll-Lock" Chucks bolt to face plates on four multiple-spindle reaming stations of Greenlee Transfer Machine. Accurate chucking assures production of straight, round holes. Faster, easier tool changes minimize costly machine downtime.

Chucks are equipped with collets for various tools and have provision for presetting.



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Precision Holding

FOR HOLDING PRECISION

Scully-Jones and Company, 1915 South Rockwell Street, Chicago 8, Illinois

BULLETIN!

52 pages of profit-boosting ideas and methods for chucking parts and tools.

Gentlemen: I'm interested in learning more about Scully-Jones "Roll-Lock" Tools . . .

☐ Please send Bulletin No. 17-50

☐ Have representative call

Name_____

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The Shaft Shows the Holding Power of ALLENPOINT Set Screws

ALLENPOINT—Smooth, even bearing surface. Deep point penetration for maximum holding power.

SERRATED POINT—Shaft penetration is slight and irregular. Bearing surface is spotty and rough.

Loosen a Set Screw and Look at the Shaft It's Pressing Against.

Has The Set Screw Made A Full Circle Impression?

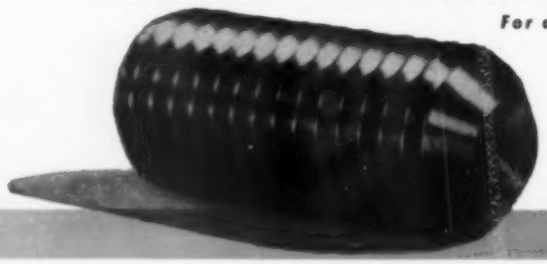
To obtain the maximum resistance to rotation and sliding movement, a set screw must bear evenly on the shaft. Allenpoint Set Screws reproduce a full circle pattern against their mating surface for increased holding power. Even on shafts of small diameter you get a full circle impression with the smaller cup point of Allenpoint Set Screws.

Has The Point Left An Uneven Ridge Around The Indentation?

The holding power of a set screw will be greatly reduced if the bearing surface is rough and irregular. Serrated point set screws cut into the shaft, raising a chip, removing stock and weakening their grip. Allenpoint Set Screws press firmly into the shaft and form a smooth, deep indentation. The result is holding power that tops any other type point.

WHEN ORDERING THROUGH YOUR LOCAL INDUSTRIAL DISTRIBUTOR, SPECIFY ALLENPOINT SET SCREWS

For additional information contact your Allen Distributor or write to —



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MANUFACTURING COMPANY

Hartford 2, Connecticut, U.S.A.

ALLEN HEAD

Man ...onths of research and planning have gone into the deve...ment of these gages—the newest in precision gaging instru...nts. Dependable and precise, they are serving ranking indus...s everywhere.

Model B-10 Electronic Height Gage & Indicator

The gaging hand has a carbide pickup probe which can be easily changed in order to vary the diameter of the ball on the end of the probe from 1/32 to 5/32 of an inch. The arm has a swivel assembly with a screw adjustment for setting the pickup head on the work. The final adjustment is made electronically by a knob on the power unit. The power unit and indicator dial have two ranges which may be changed to suit the requirements of the purchaser.

Model C-10 Snap Gage and Power Unit

An instrument designed to meet the requirements of modern high speed production. This gage may be used to check diameters to tolerances as close as .00001 of an inch without removing the part from the machine. The snap gage is used in conjunction with our standard power unit. The unit is furnished with two optional ranges which can be varied to suit the requirements of the purchaser.

JEWELS OF PRECISION

Model A-10P Electronic Comparator & Indicator

An Electronic Comparator that has proven itself in gage laboratories and on production inspection in plants where precision is the prime requirement. This instrument can be furnished with from one to four increment ranges to suit your requirements. The range classifications are changed simply by dialing a knob on the power unit for the desired range. This instrument can also be furnished with a recording device for use in statistical quality control inspection or as a special gage for inspecting and maintaining records of gage blocks.

Write ***Dept.TAM-12*** for booklet and complete information on these gages or any of the Merz wide range of precision instruments. You will find them amazingly superior to all other gages.

MERZ

ENGINEERING INCORPORATED

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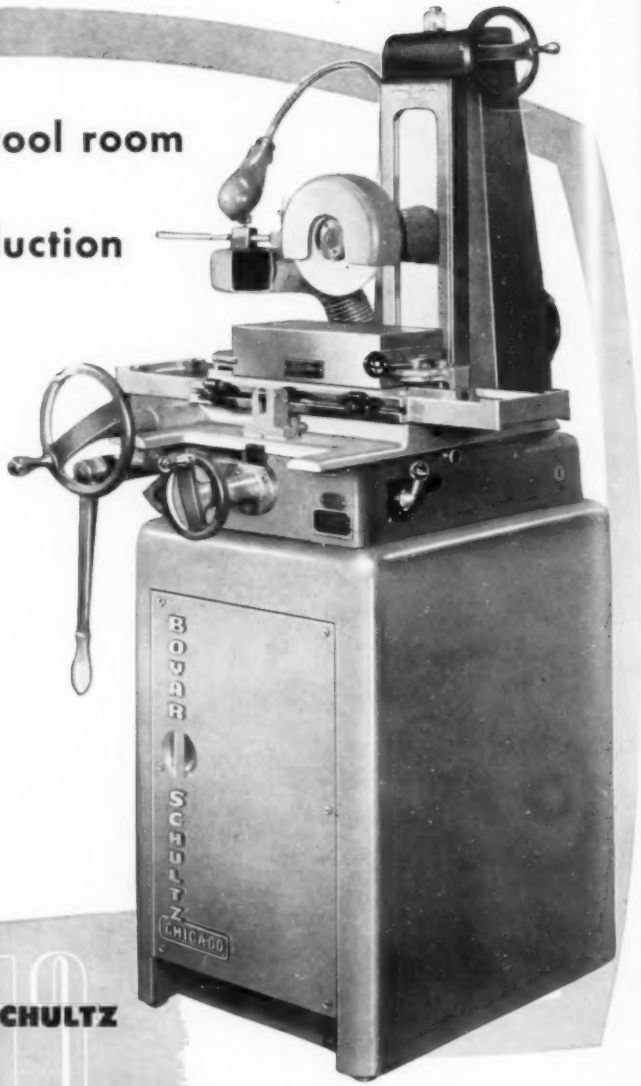
Accuracy for the tool room
Precision for production

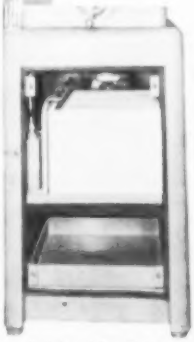


WET COOLANT ATTACHMENT. Furnished complete with pump and splash guards, drilled hole and sealing gaskets. Either pump or splash guards available separately.

HANCHETT Magna-Lock MAGNETIC CHUCK WITH RECTIFIER. Furnished in two sizes—5x10 or 6x12.

ADJUSTABLE LONGITUDINAL TABLE STOPS for more rapid production.

DIAMOND DRESSER AND DIAMOND. A sturdy fixture presenting a generous surface to magnetic chuck.



BOYAR-SCHULTZ DUST COLLECTOR FOR No. 6-12 GRINDER

Furnished as optional equipment for No. 6-12 Surface Grinder. Unit is fitted into a specially designed stand and made expressly for this grinder. With it the grinder requires no more floor space.

With this Dust Collector, the Surface Grinder is operated entirely independent of a central collecting system. The entire assembly may be easily and quickly removed for complete cleaning when necessary.

BOYAR-SCHULTZ

6-12 surface grinder

A PRECISION Machine Tool specially designed to provide the close tolerance performance usually expected only from larger and more costly grinders.

Boyar-Schultz No. 6-12 Surface Grinder has shown repeatedly that it is fully capable of handling a large part of the daily work that is ordinarily done only on larger machines.

Because the first cost is so low, and the quality of performance is so high, it is most economical to place several No. 6-12 Surface Grinders at strategic positions in your tool room, where they are quickly available.

Many users tell us they are able to obtain flatness, horizontal and vertical tolerances with this grinder, that compare with any other precision surface grinder, regardless of size.

This excellent performance is the net result of unusually sturdy design, fine materials and the efforts of craftsmen who themselves know what a precision machine tool must do.

Big Machine Performance—Small Machine Cost!

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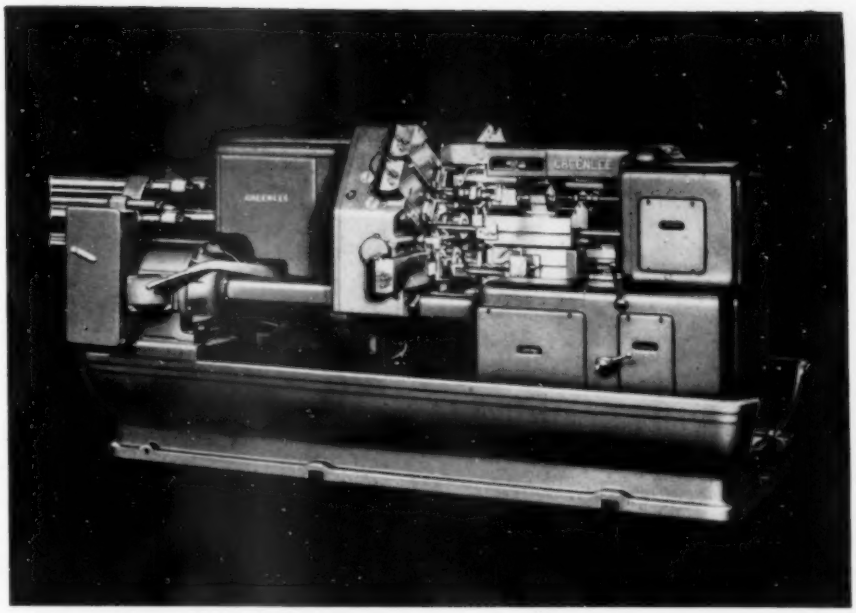


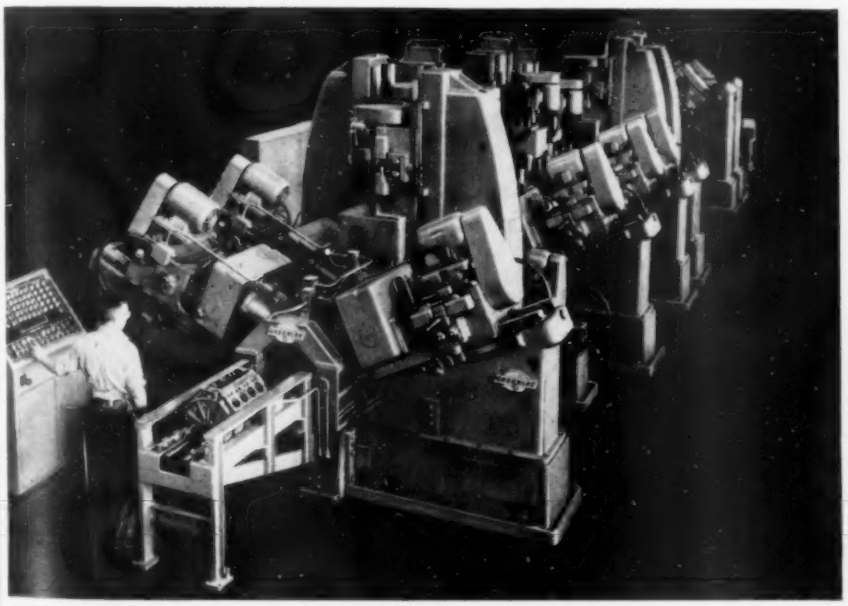
Greenlee Machines feature maximum economy of operation on short-run as well as long-run jobs . . . because of quick change-over, wide-open tooling area, great versatility, low tool cost, and a wide variety of accessories.

The Greenlee "Six" is available in 1″, 1-5/8″, and 2″ capacity — the "Four" in 1-5/8″ and 2-5/8″ capacity. This range covers the majority of all machine-shop needs.

Automatic Screw Machines

GREENLEE

Special Machine Tools



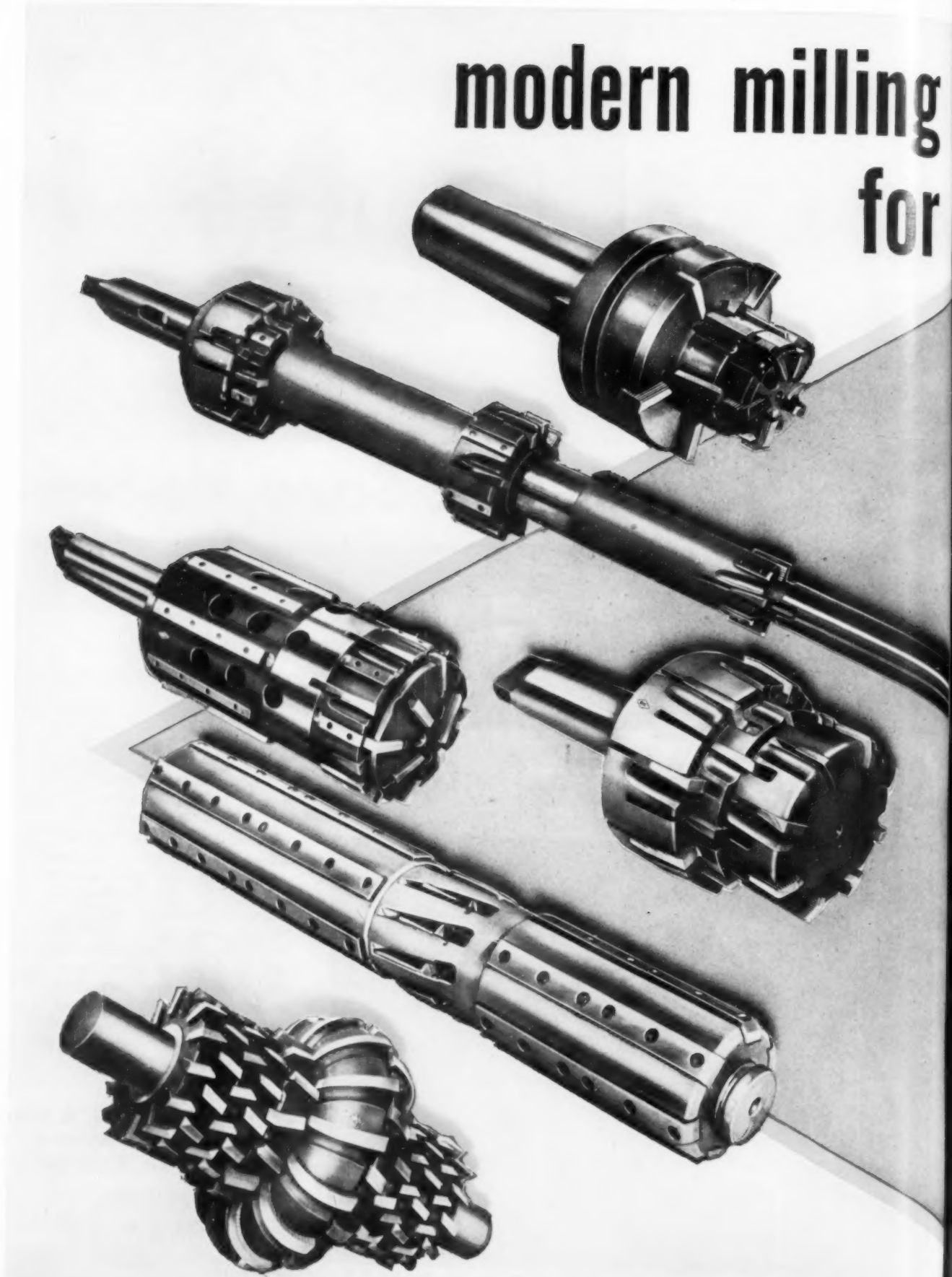
The first Greenlee "special" machine was designed and built in 1918, and Greenlee was also a pioneer in the development of automatic transfer machines now widely used in the mass-production industries. Greenlee machines are made up of *proved* units and mechanisms, specially combined to perform specific work . . . consequently, they show remarkably good performance right from the start of their operation.

GREENLEE BROS. & CO.
1894 MASON AVENUE
ROCKFORD, ILLINOIS

GREENLEE

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

modern milling for



cutters
modern milling machines

multiple diameter milling with carbide

With properly designed carbide cutters you can make two, three and more cuts with one pass of the tool, remove four to twelve times as much metal compared to high speed steel cutters. To realize the full benefits of this high productivity, your milling machine must be in tip-top condition and take the accelerated speeds and feeds without vibration or backlash. The workpiece must be rigid and anchored close to the table.

On the left is a group of typical OK tools for multiple cutting with either high speed steel or carbide blades. OK cutters are sound in basic design. The simple, two-piece construction—body and blades—is the ultimate in strength, power and efficiency. Blades, once set, are immovable, and yet come out with a drift in a jiffy. They are easy to regrind and replace.

OK is backed by an experience of 50 years . . . engineering thousands of carbide milling and boring tools.

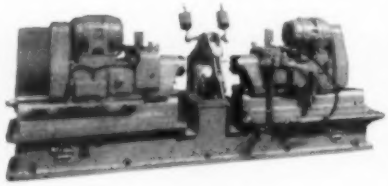
On request we would be glad to send you the latest edition of Catalog 13 entitled "Modern Milling Cutters For Modern Milling Machines."

The OK **Tool Company, inc.**
MILFORD NEW HAMPSHIRE

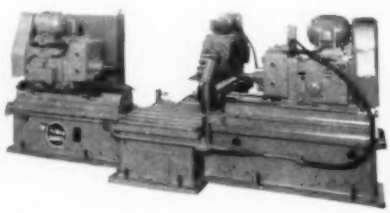
10 solutions

TO DIVERSE PRODUCTION PROBLEMS WITH W.F. & JOHN BARNES SPECIAL MACHINES AND EQUIPMENT

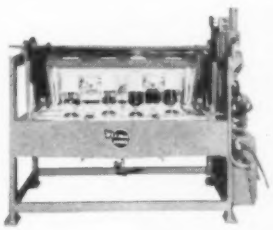
The 10 examples shown here are typical of the broad range of special machinery and allied equipment that are today designed and built at W. F. & John Barnes. All have been especially engineered to meet a specific production problem. Each represents a profitable solution to the problem of saving time and cutting costs. Collectively, these machines present tangible evidence of the coordinated skills and versatility of machine building experience available to you at Barnes.



1 TWO-WAY HORIZONTAL BORING MACHINE — rough bores and chamfers automobile transmission cases at 82.5 pieces per hour (80%). This unit completes 18 operations.

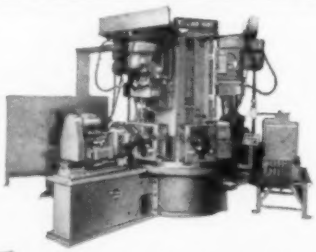


2 BARNES SPECIAL MACHINE — drills and counter-sinks Tractor Spindle Extensions. Performs ten operations with pieces completed at the rate of 19.5 per hour (80%). Center head has 4-spindle cluster arranged for pivoting to provide adjustable spindle pattern.

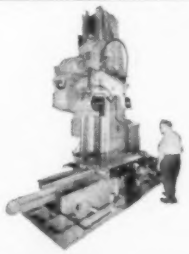


3 SPECIAL SEMI-AUTOMATIC TESTING MACHINE — developed to test for leaks in automotive power steering castings. Four castings are inspected with each machine cycle. Workpieces are loaded and unloaded manually . . . all other operations are performed automatically.

4 AUTOMATIC RETORT LOADING MACHINE — one of a variety of special equipment, such as glass handling machines, can unloaders, carton uncasers, and special conveyors, designed and built by Barnes for the food, chemical, and beverage industries.



5 BARNES 6-STATION CENTER COLUMN MACHINE — with 72" diameter indexing table, completes 18 operations per piece, 118 pieces per hour, on Cast Aluminum Transmission Extension Housings in a large automotive plant.

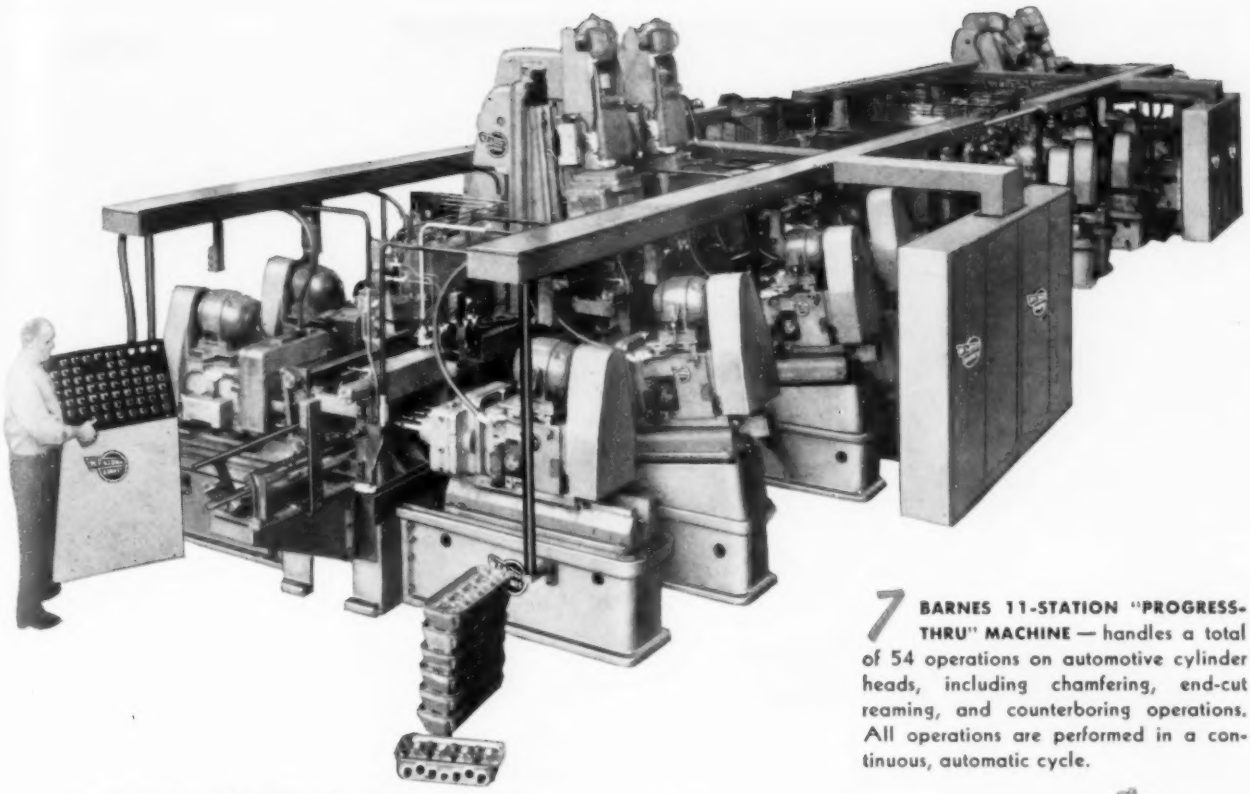


6 SPECIAL VERTICAL SINGLE-SPINDLE MILLING MACHINE — with 72" saddle, slab and face mills mounting pads on a variety of motor frames. Quick setup features enable 6½ pieces to be completed per hour.

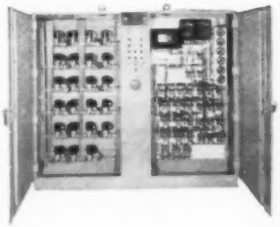
W.F. & JOHN BARNES

BUILDERS OF BETTER MACHINES SINCE 1879

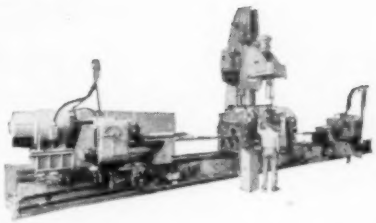
MULTIPLE SPINDLE DRILLING • BORING • TAPPING



7 **BARNES 11-STATION "PROGRESS-THRU" MACHINE** — handles a total of 54 operations on automotive cylinder heads, including chamfering, end-cut reaming, and counterboring operations. All operations are performed in a continuous, automatic cycle.



8 **ELECTRICAL CONTROL PANEL** — automatically controls regeneration and service operations on two sets of deionizing tanks, alternating units for a constant supply of treated water . . . one of countless applications where Barnes Electrical Controls add efficiency and economy to everyday industrial operations.



9 **SPECIAL TWO-WAY VERTICAL AND HORIZONTAL BORING MACHINE** — rough, semi-finish, and finish-bores, chamfers, and faces Final Drive Housings. Spindles automatically change speeds and feeds to meet boring and facing requirements.

10 **APRON-TYPE CONVEYOR** — especially designed for efficient removal of chips from machines used in a large automotive plant. Barnes Conveyors have been designed and built for a wide variety of applications.

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COORDINATED DESIGN AND ENGINEERING — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Teamwork solves complex problems quickly.

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APEX INSERTED-BLADE METAL-CUTTING TOOLS

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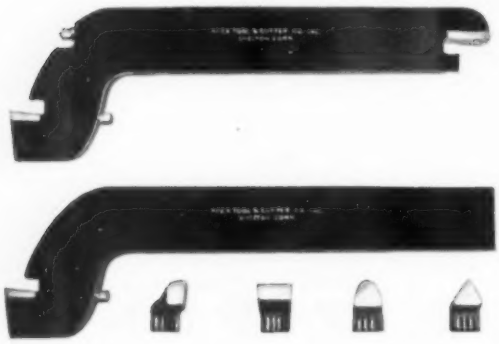
Made with inserted blades, all drop-forged of selected steels.

Adjustable for diameter or width.

Single or multiple operations with blades of High Speed, Super Cobalt, Stellite, Rexalloy, or Carbide Tipped. Standard sizes, including large diameters, carried in stock.



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Tools drop-forged of High Speed Steel, Super Cobalt Steel, or tipped tools of Stellite, Rexalloy, or any grade or make of Carbide. Furnished ground ready for use.

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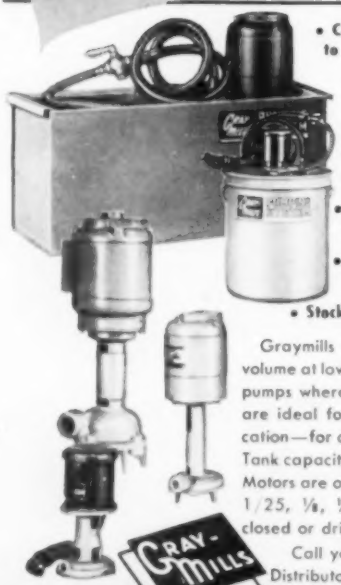

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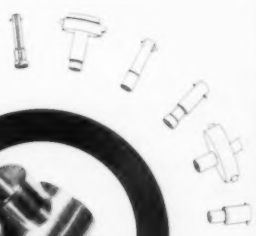

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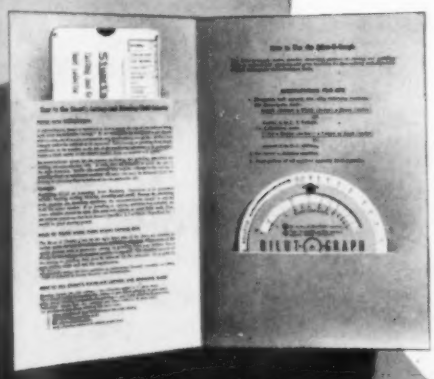
What Cutting Fluid to Use?

The FREE Stuart Cutting and Grinding Fluid Selector has the answer



There is a right cutting fluid for every cutting and grinding job . . . and sometimes it's hard to know where to start in selecting one. For that reason Stuart has developed this FREE Cutting and Grinding Fluid Selector. It's a ready reference that recommends cutting and grinding fluids that field experience has shown to be most suitable under average job conditions. In your hand it's a quick guide to starting recommendations for any job. Send for your Stuart Cutting and Grinding Selector today. Remember, more than a "coolant" is needed . . . let the Stuart Selector help you get the right cutting fluid to give you the best results.

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This handy folder contains a Stuart Cutting and Grinding Fluid Selector and a Dilut-O-Graph . . . a circular slide rule that makes the diluting of cutting fluids quick and easy. They are double-barreled assurance of having the right cutting fluid on all jobs.

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Commander LĒAD-MATIC *Tapper*

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FOR HIGH PRODUCTION PRECISION TAPPING

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- Easily Adapted to Any Drill Press
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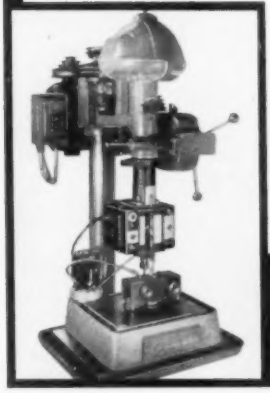

Built for high production tapping . . . precision or otherwise, the Commander Lēad-Matic Tapper makes any drill press a precision tapping unit, even with inexperienced operators. Electric control of Cycle or Jog tapping action provides versatility to handle any job . . . automatic tap reversal eliminates drill press motor reversing and speeds tapping. Compact, ruggedly built, easy to operate, the Commander Lēad-Matic Tapper will cut your tapping costs and reduce rejects to a minimum.

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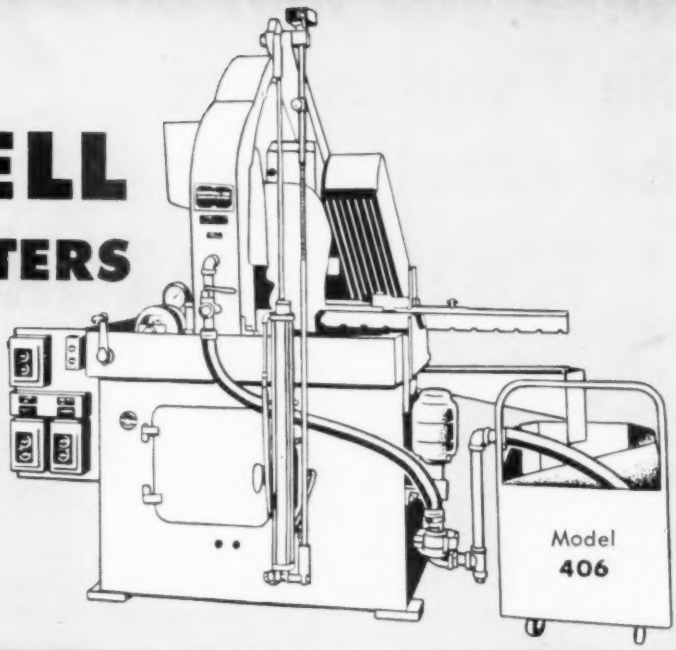

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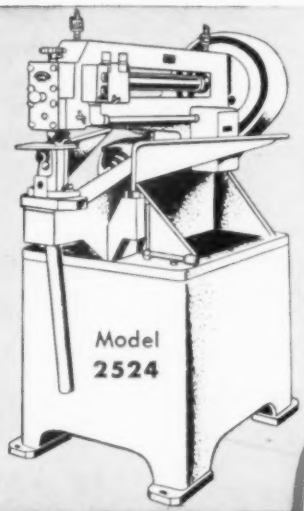

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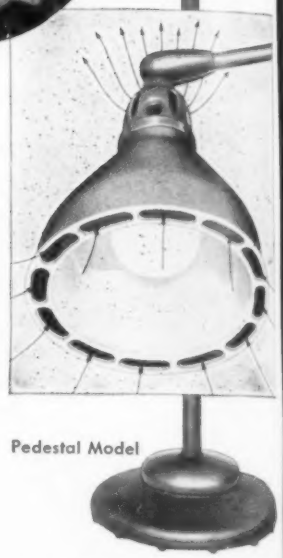
Dazor Fluorescent Floating Lamp: A stand-by in every type of industry and institution, this lamp improves seeing conditions for millions. Universal, pedestal, desk, business machine and bracket models, AC or DC.

Call Your Dazor Distributor for details and an early demonstration of any Dazor. If you wish the name of this helpful lighting authority, write Dazor Manufacturing Corp., 4481-87 Duncan Ave., St. Louis 10, Mo. *In Canada* address inquiries to Amalgamated Electric Corporation Limited, Toronto 6, Ontario.



Pedestal Model

Dazor Air-Cooled Incandescent Floating Lamp

Dazor Floating Magnifier with Fluorescent Lighting
Universal Model

Dazor Fluorescent Floating Lamp
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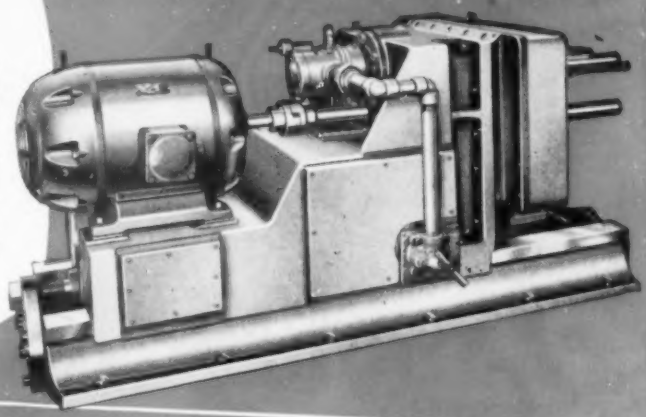
For Aircraft and Automotive Industries

BAUSH POWER UNITS

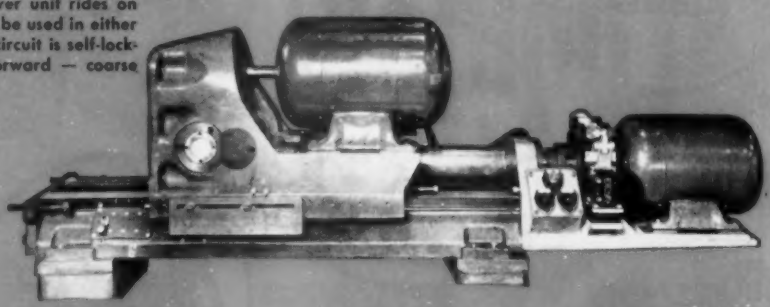
are available in

HYDRAULIC — ELECTRICAL and CAM TYPES

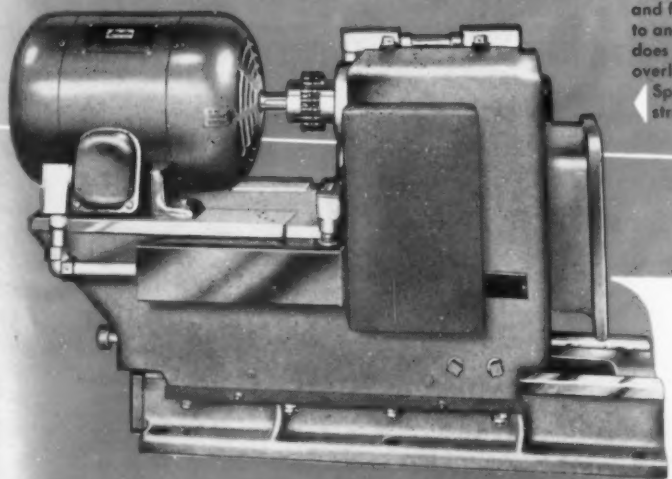
Readily adaptable as individual drives for Transfer Lineups, or for 2-way or 3-way automatic machine tools. BAUSH POWER DRIVES can be mounted vertically or horizontally and offer many practical features.



HYDRAULIC FEED POWER UNIT. Equipped with Vickers hydraulic controls and a self contained hydraulic system this BAUSH POWER UNIT assures dependable and efficient performance at all times. . . . Large mounting flange permits the mounting of multiple drill heads. Power unit rides on hardened and ground steel ways and may be used in either a vertical or horizontal position. Control circuit is self-locking and operation cycles are — rapid forward — coarse feed — fine feed — rapid return.



7.5 ELECTRICAL UNIT. This BAUSH POWER UNIT is fed through leadscrew on dovetail ways and is available in variable strokes of 12"—18"—24". This drive can be furnished with either single or multiple spindle fixed center head and is readily adapted to either drilling or tapping. . . . Maximum H.P. — 7½ at 1800 R.P.M. . . . Rapid travel forward and reverse at 450" per minute. . . . Feed Range: 1" to 60" per minute.



CAM UNIT. Unexcelled for simplicity of operation on production work. One revolution of cylinder cam limit switch controls entire cycle of — rapid approach forward — feed (with dwell for facing, if desired) — rapid return and stop. . . . Complete within itself it can be mounted either vertically or horizontally and features an extremely flexible feed which can be governed to any rate by interchanging pick-off gears. Cam replacement does not require the complete dismantling of unit and an overload clutch prevents work damage and tool breakage. . . . Spindle speeds: 150 to 1250 R.P.M. . . . Model 1 has 6" stroke — Model 2 has 8" stroke.

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For Triangle... Round... Square Inserts

"Built-In" Versatile Carbide Chipbreaker Eliminates Chipbreaker Grinding... Permits Using All the Carbide

The New V-R Toolholders make it possible, for the first time, to use all of the carbide insert. The superior design "Built-In" carbide chipbreaker of extreme versatility provides correct chip formation over wide cutting range for single chipbreaker width and eliminates expensive chipbreaker grinding. Get full details in the new V-R Toolholder Catalog VR-435.

Versatile Carbide Chipbreaker. More edge life—less heat.

No Chipbreaker grinding.

Uses all the carbide.

Cut Carbide

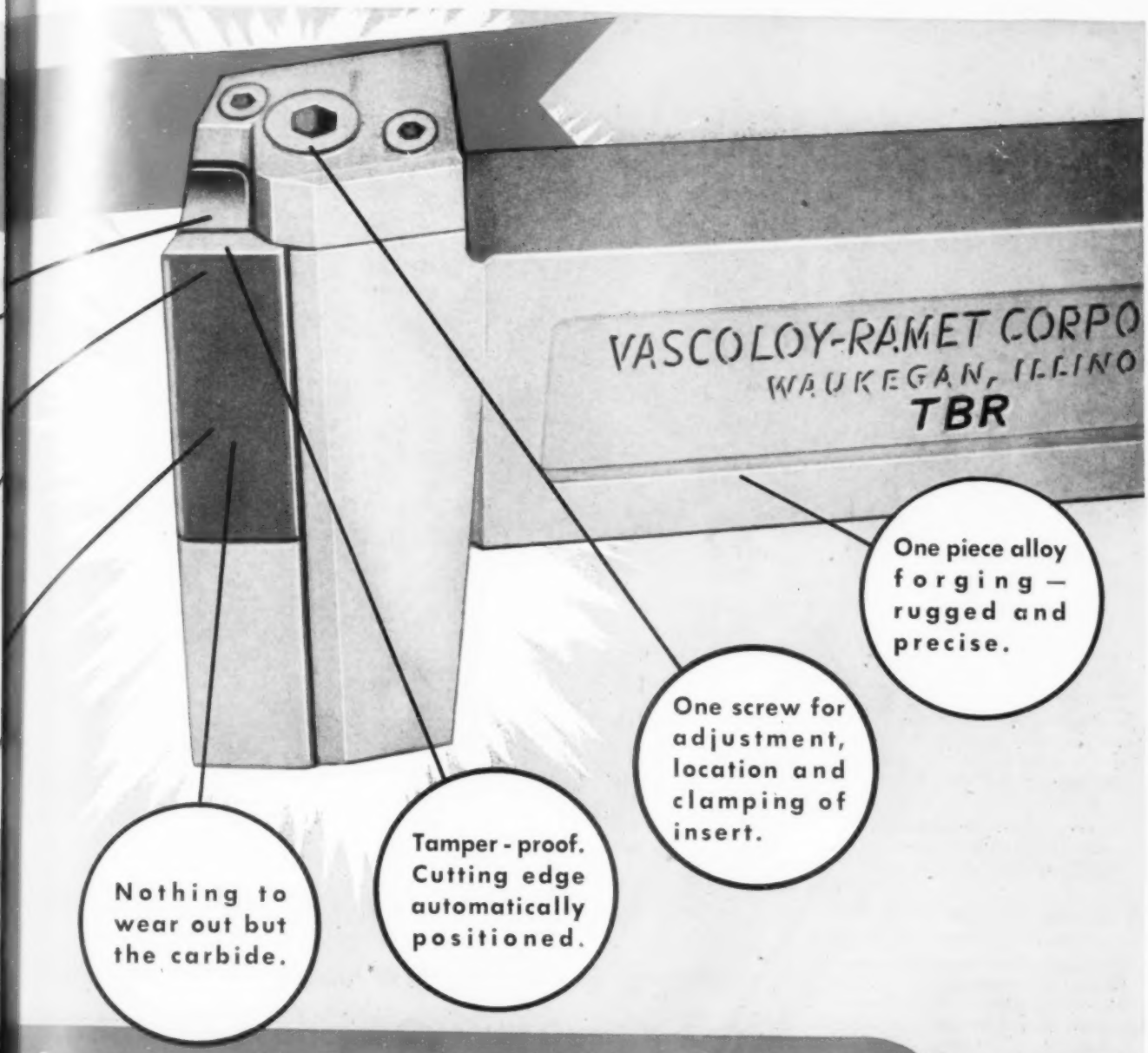
V-R Standard Length Inserts 1 1/2" Long

STANDARD LENGTH INSERTS GIVE YOU ADDED CARBIDE LENGTH, when used in the New V-R toolholder. New design gives you up to 84% more utilization of a carbide insert than is possible in any other toolholder. Standard length inserts are still the same, high quality, carbide Vascoloy-Ramet has always produced. Cut your carbide costs by using standard length inserts in the New V-R toolholder.

*Patent Pending

DESIGNED AND MANUFACTURED BY

V-R — Cemented Carbides • Tantung Cast Alloys • Vascoloy-Ramet Corporation


VASCOLOY-RAMET CORPO
WAUKEGAN, ILLINO
TBR
One piece alloy forging — rugged and precise.
One screw for adjustment, location and clamping of insert.
Tamper-proof. Cutting edge automatically positioned.
Nothing to wear out but the carbide.

Inventory By 50% Or More!

V-R "Half-Length" Inserts 3/4" Long

"HALF-LENGTH" INSERTS COST LESS . . . GIVE MAXIMUM CUTTING. V-R toolholders use at least 85% of the carbide of half-length inserts. Machining with half-length inserts in V-R toolholders begins, where machining stops, with standard length inserts in ordinary toolholders. Lower initial cost, greater usage, elimination of chip-breaker grinding results in lower inventory and cutting cost with half-length inserts.

V-R "Throw-Away" Length Blanks

"THROW-AWAY" BLANKS ELIMINATE GRINDING. Designed to use all cutting edges on both ends without grinding results in the lowest cost per cutting edge obtainable for any insert. Blanks are used and then thrown away. Throw-away blanks are available either as: PRECISION, ground all over to the same tolerances that apply to standard length and New V-R half-length inserts, used where precision indexing is necessary, or desirable. UTILITY, ground on two faces only, used where precision indexing is not necessary.

WRITE FOR FREE V-R TOOLHOLDER CATALOG VR-435

Vascoloy-Ramet Corporation

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TAPS *by* CARD

The best way to gauge the value of a tap is to try it. You'll find Card taps live up to their reputation every time.

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Now... a 30-inch Contour Projector with Kodak's Advanced Optical Design

Ever since the first Kodak Contour Projector was built six years ago, engineers have asked for a 30-inch model with the same advanced optical refinements.

Now the new Kodak Contour Projector, Model 30, answers industry's need for a precision measuring instrument to handle large parts quickly, conveniently.

If yours is one of the hundreds of companies already using optical gaging methods, you'll want to learn how the new "Model 30" can boost efficiency in present operations. If you are not making use of optical gaging, you'll want to learn how the Model 30 makes its use far easier and more economical than ever before.

For complete details of the Kodak Contour Projector, Model 30, write to:

EASTMAN KODAK COMPANY
Special Products Sales Division
Rochester 4, N.Y.

the KODAK CONTOUR PROJECTOR

Check these outstanding features of the Kodak Contour Projector, Model 30:

Self-Contained Normal Surface Illuminator. Built-in 1500-watt light source provides maximum surface illumination to inspect surface details, recesses, and blind holes.

Kodak Magnification Selector. Lens turret provides choice of magnifications at the flick of a switch.

Par-Focalized Kodak Projection Ektar Lenses. Six specially designed lenses provide magnifications from 10× to 100×. No refocusing necessary when you change magnification.

Uniform Work Area At All Magnifications. Kodak's unique relay lens system gives you a uniform 8-inch clearance between the part and optical system regardless of magnification selected.

Bright Screen Image. The 500-watt light source for shadow projection provides sharp, easy-to-read screen image across the full 30-inch diameter.

Built-In Helix Table. Worktable rotates 15° off center for compounding helix angles.

Direct-Reading Rotary Screen. Graduated to 2′ of arc. Angular measurement is read directly from a dial without vernier. Dial may be zeroed, eliminating lost time in aligning protractor ring.

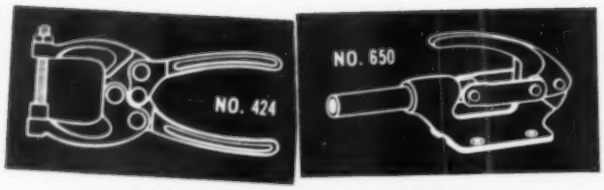
64-Sq.-In. Measuring Area. Eight-inch horizontal and eight-inch vertical table provides an area of 64 square inches for direct measurement. Worktable measures 26″ x 8″.

Uni-Strut Assembly. Provides maximum rigidity. Projection lenses and mirrors sturdily mounted on a single member.

Compact Design. Floor space required for the Kodak Contour Projector, Model 30, is approximately 1/5 less than that required for other 30-inch projectors.

See the Kodak Contour Projector, Model 30, at the Tool Show, Booths 307 and 311.

Kodak



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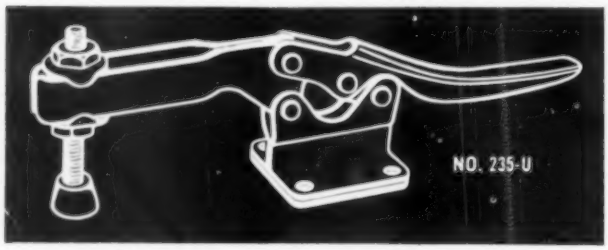
Invites you to see its complete line of fast-acting, production work-holding tools



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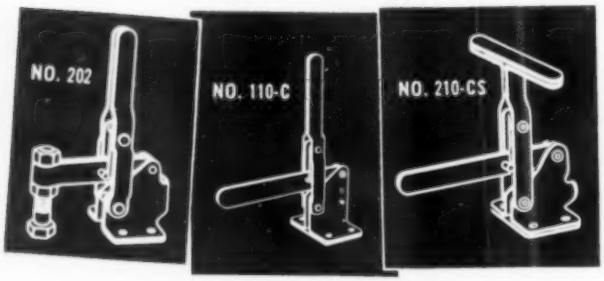
ON DISPLAY AT BOOTH 440, PRECISION HALL
ASTE INDUSTRIAL EXPOSITION



Over 40 stationary and portable models with positive holding pressures to 4000 lbs.

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DESTACO **DETROIT STAMPING COMPANY**
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OUTLASTS DEAD CENTERS MANY TIMES OVER!

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UNCHALLENGED ACCURACY!

Get every dollar's worth of production from QUADRO PRECISION LIVE CENTERS—designed to support the HEAVIEST load at HIGHEST speed for the LONGEST time! Guaranteed accurate to .00005"—they will outlast dead centers by far!

Each QUADRO CENTER completely eliminates friction—two double row pre-loaded ball bearings absorb combined radial and thrust. You'll discover its remarkable efficiency on a lathe, miller OR ANY OTHER MACHINE TOOL!

TODAY—see your regular supply dealer for Complete Facts or write to:

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TOOL & MACHINE CO., INC.
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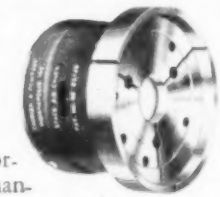
"TWO DECADES OF IMPORTANT TOOL PARTS PRODUCTION"

USE READER SERVICE CARD; INDICATE A-4-404-2

STACE

71-A Air Chuck



New Stace 71-A Air Chuck incorporates all *precision* features of manually-operated Models 41 and 71-M. Order for either OD or ID. Minimum capacity ½"—maximum 9½". Close tolerance—.0005 guaranteed. Simple, rugged. Saves time, increases accuracy, cuts rejects, reduces costs

A few sales territories open—address
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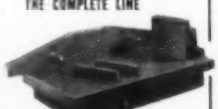
DON'T SCRAPE DON'T SCRAP worn surface plates them either . . .

Step-them-down and continue using them for less accurate work.

You'll save enough money to replace with Rahn Diabase for your most accurate work.

THE COMPLETE LINE



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It's being done. Many companies have adopted this NO COST way of converting from metal to Rahn Diabase (black granite) Surface Plates.

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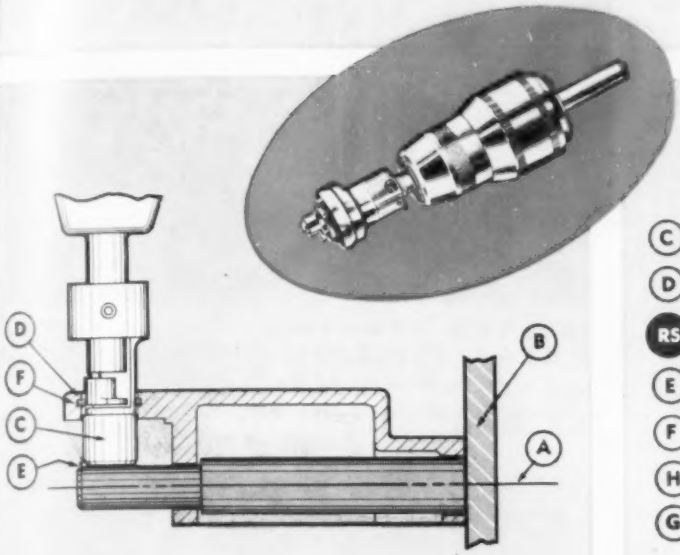
USE READER SERVICE CARD; INDICATE A-4-404-4

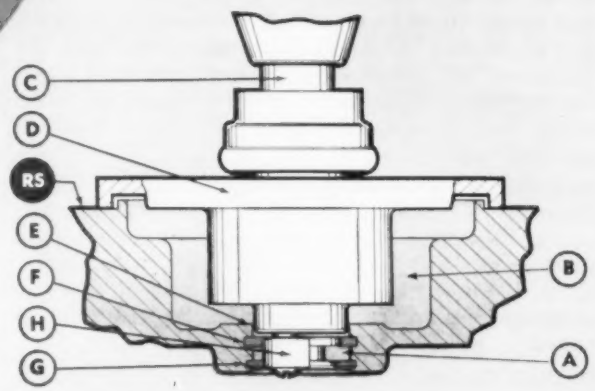
Waldes Truarc grooving tool solves tough internal grooving problems, cuts costs in assembly-line production



Problem: Locating a Groove From Centerline of a Hole A.

(a) Workpiece is fitted into plug on fixture plate **B**.

(b) Bottom adaptor **C** on standard Waldes Truarc Grooving Tool is piloted into bore **D** and registers on side of plug **E**. Groove **F** is cut in exact location required.



Problem: Cutting Two Grooves—One Rectangular, One Beveled—Located In Bore *A* In Large Cavity *B* of Workpiece, and Located From Reference Surface *RS*.

(a) Waldes Truarc Grooving Tool is fitted with elongated spindle assembly **C** and special bushing **D** which spans large cavity permitting tool to register on reference surface ***RS***. Bushing also pilots tool into counter-bore at ***E***.

(b) Both grooves ***F*** and ***G*** are cut simultaneously with special form cutter ***H*** having both required contours.

AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even *unskilled labor* can perform and maintain high precision, mass production operations.

WIDE CUTTING RANGE! The Waldes Truarc Grooving Tool comes in five models: A-1, A-2, A-3, B and C. This wide variety of models enables you to cut accurate grooves in housings with diameters from .250 to 5.00 inches. Special features, modifications and adaptations allow each model to operate efficiently under many varying conditions.

SEND YOUR PROBLEMS TO WALDES! Whatever your internal grooving problem, send us your blueprints and let Waldes Truarc engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job.

"See the Waldes Truarc exhibit at the A.S.T.E. Show, April 26-30. Booth No. 424, Precision Hall"

WRITE *NOW* FOR 20-PAGE MANUAL CONTAINING FULL INFORMATION ON WALDES TRUARC GROOVING TOOL

WALDES

TRUARC

REG. U. S. PAT. OFF.

GROOVING TOOL

MADE BY THE MANUFACTURERS OF
WALDES TRUARC RETAINING RINGS.
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.

WALDES TRUARC GROOVING TOOL MANUFACTURED UNDER U. S. PAT. 2,411,426

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool.

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Title .....

Company .....

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TE-046 ★

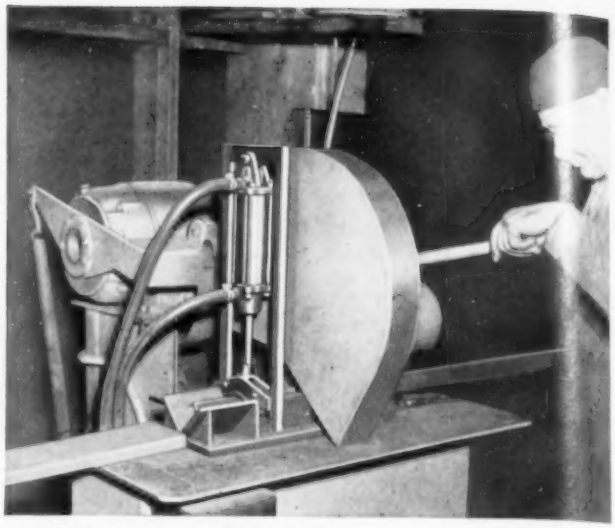
Clamping Device on Abrasive Cut-off Saw Operated by NOPAK

MODEL E CYLINDER

This efficient clamping device was developed by a Canadian distributor of industrial supplies, to speed up and simplify the cross-cutting of pipe, rod stock, angle iron and other shapes. A NOPAK 2" x 6" Model "E" Cylinder, suspended from the top of an "A" frame, supplies the downward pushing power which holds the stock firmly in place while the abrasive saw does the cutting quickly, squarely and accurately.

Cylinder is actuated by a NOPAK Model "F" Foot Operated Valve which leaves operator's hands free . . . and enables him to move about between cuts until he again steps on foot lever to release clamp. Slow, manual manipulation of clamps or vises is completely eliminated, valuable time and effort is saved.

NOPAK Cylinders and Valves are used throughout industry, in thousands of similar applications, to accelerate production, reduce costs, minimize fatigue. Ask your NOPAK representative to show you the NOPAK Application Manual.



GALLAND-HENNING NOPAK DIVISION

2750 S. 31st St. • Milwaukee 46, Wis.

Refer to Sweet's File for Product Designers or write for Bulletin SW-2.

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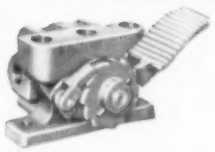

NOPAK Model "F" Foot Valve

NOPAK

VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

USE READER SERVICE CARD; INDICATE A-4-406-1

ELIMINATE * HUMAN ERRORS WITH INDICATING MICROMETER & COMPARATOR

COMPARATOR MASTER MICROMETER GO-NO GO GAGE 1" RANGE IN 10000ths - NO GAGE BLOCKS NEEDED

* HUMAN ERRORS THROUGH DIFFERENCES OF "FEEL" ELIMINATED. WILL DETECT OUT-OF-ROUNDNESS, OVALNESS AND TAPER.

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GEORGE SCHERR CO., Inc.

200-TE Lafayette St. • New York 12, N. Y.

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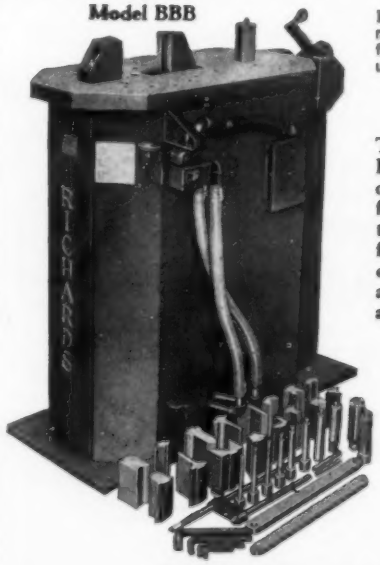
Multiform

BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Model BBB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller hand or air operated models for forming up to ⅜"x1¼" material.

Send for illustrated folder TE-5

903 North Pitcher St. Kalamazoo, Michigan

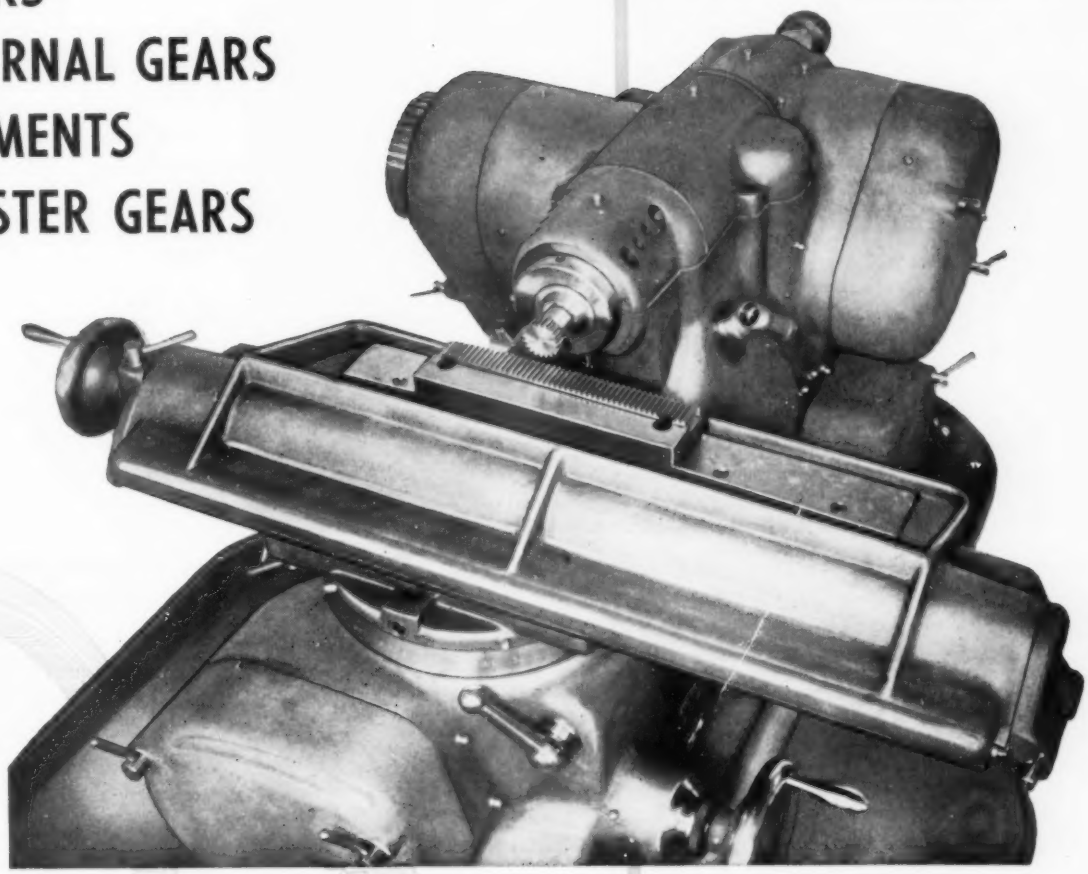
J. A. RICHARDS CO.

USE READER SERVICE CARD; INDICATE A-4-406-3

MIKRON *fine pitch*

RACK & GEAR CUTTER NO. 134—
Another machine in the MIKRON line—*Controlled Accuracy. High Finish, Ease of Set-Up.*

- **RACKS**
- **INTERNAL GEARS**
- **SEGMENTS**
- **CLUSTER GEARS**



THE precision cutter shapes as it generates tooth forms. The work meets your most exacting specifications and standards. Gear production requiring a shaping operation will be ideally performed with the MIKRON No. 134.

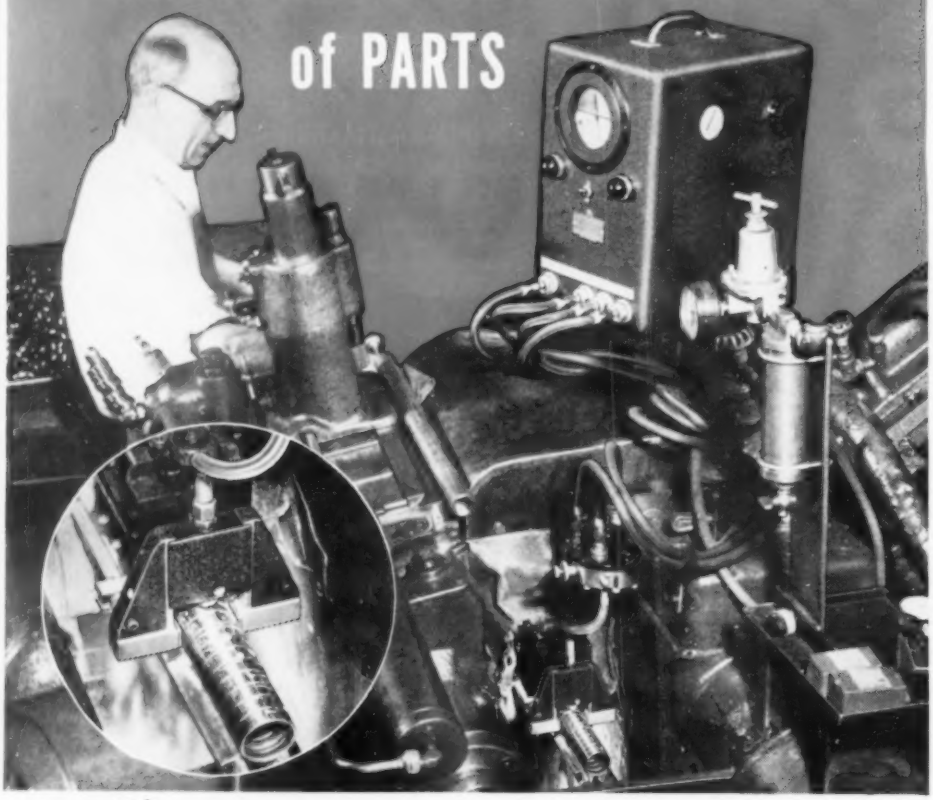
WORK PIECE CAPACITY

RACKS: (Straight or Skew) to 36" long x 1" wide.
SEGMENTS & CLUSTERS: to 3⅛" dia. x 1" wide.
INTERNAL GEAR: to 4" dia. x 1" wide.

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

Continuous ON-MACHINE GAGING of PARTS



with

PRATT & WHITNEY AIR-O-LIMIT *Gages*

Engineered by Pratt & Whitney for a leading bearing manufacturer, this special application utilizes an Air-O-Limit Gage with Light Signal Control Unit mounted directly on a centerless grinder used to finish outer bearing races. These races ***must be accurate*** . . . tolerances are held to .0003". As the races are fed from the machine, they are gaged ***continuously and automatically*** . . . providing these important advantages:

- **REDUCED SCRAP LOSS** . . . Rejects used to average 1.5%; have dropped to as low as 0.59% for a full week's production.
- **FASTER PRODUCTION RATE** . . . up to 90 races per minute, without sacrificing accuracy . . . is possible as a result of continuous gaging.
- **LESS NON-PRODUCTIVE TIME** . . . operator can correct machine before parts exceed limits *without* stopping production.

SEE THE AIR-O-LIMIT GAGE at the A.S.T.E. SHOW! Philadelphia . . . April 26-30

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.
SINCE 1860

Bring your special gaging problems with you. Talk them over with the P&W Gage Engineers at Booth No. 1531. They can provide the answers.

First Choice for Accuracy

BRANCH OFFICES AND STOCK . . . BIRMINGHAM* • BOSTON • CHICAGO
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ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

MACHINE TOOLS • CUTTING TOOLS • GAGES

AUTOMATION is a PRACTICAL tool

IT'S COMING YOUR WAY . . . COSTS NEEDN'T BE PROHIBITIVE . . . HERE ARE THE SIMPLE FACTS

Despite recent developments in some fields, the completely automatic factory . . . with raw materials fed into one end of a mile-long transfer machine and finished products emerging from the other . . . is something in the rather distant future for most manufacturers. However, Automatic Process Control (which will be a vital *part* of eventual complete automation) is just around the corner. For thousands of manufacturers it will soon provide the immediate, practical answer to industry's need to produce more accurate parts faster and at lower cost.

SELF-CORRECTING MACHINES ARE NEXT

Automatic "self-operating" machines are now in common use; tomorrow these machines will be "*self-correcting*" as well. Pratt & Whitney Gages, for example, have already been applied to many types of machining and other operations to provide automatic, in-process gaging. All that remains is to provide a "feed-back" from the gage to the machine to effect corrections automatically. The P&W Gages and Control Units to accomplish this are now available, and Pratt & Whitney is working in close cooperation with several machine manufacturers to develop modifications in machines that will permit adjustment by gage-activated means rather than by hand.

SUCCESSFUL INSTALLATIONS ALREADY EXIST

While widespread availability of self-correcting machines must depend on further developments, there are some installations already in highly successful operation. Pratt & Whitney Control Units are being used in con-

junction with P&W Continuous Gages to provide screwdown control that automatically corrects variations in thickness of steel being cold rolled. Similar installations automatically correct the thickness of plastic coating on extruded wire. Many other types of installations are now being engineered and will soon be in operation.

ADVANTAGES ARE MANY

The advantages of self-correcting machines are many and important. Production rates are greatly increased without sacrificing accuracy; even where extreme precision is the primary consideration, greater volume and more reliable accuracy are obtained. Corrections are made without stopping the machine, thus nonproductive periods are eliminated and further increases in overall volume are realized. Rejects are greatly reduced. Gaging as a more expensive separate operation is eliminated. Where a permanent inspection record is required, automatic recording devices are readily incorporated.

HISTORY-MAKING GAGES SHOWN AT A.S.T.E. SHOW

Several of the gages that are now making self-operating machines a practical reality . . . and many others in the complete Pratt & Whitney Line . . . can be seen at Pratt & Whitney Booth No. 1531 at the A.S.T.E. Show. Included will be the newly developed syncro-transfer signal control, the new Model D Universal Internal Comparator, Air-O-Limit and Electrolimit Internal and External Clearance Calculators with Differential Computors, the new Model G Air-O-Limit Comparator, and the recently re-designed Millionth Comparator that incorporates such important improvements as a new 4-Way Magnification Switch that provides even greater versatility. Pratt & Whitney Gage Engineers will be on hand to explain all equipment and discuss individual gaging problems. Also at the Show . . . a complete display of P&W cutting tools and conventional gages.

Continuous ON-MACHINE GAGING of GROUND BAR STOCK

with

PRATT & WHITNEY
Electrolimit Gages

Developed originally for cold rolling mills, the Pratt & Whitney Electrolimit Model D Gage is here applied to continuous, on-machine gaging of precision, centerless ground bar stock. The P&W Light Signal Control with meter used in conjunction with the gage, gives a continuous, accurate reading; light signals indicate oversize or undersize. Important benefits include:

- **BETTER CONTROL OF GRINDING ACCURACY** . . . with immediate correction of machine *before* work is spoiled.
- **FASTER PRODUCTION** . . . operator continuously sees size variations due to wheel wear and makes corrections during grinding.
- **GREATER OPERATOR CONVENIENCE** . . . indicating meter is easy to read; corrections are easier, faster. Extra gaging operations are eliminated.

SEE THE ELECTROLIMIT GAGE at the A.S.T.E. SHOW
PHILADELPHIA, APRIL 26-30 — BOOTH 1531

Our Gage Engineers will be on hand to give you complete information and show you how P&W can help solve your specific gaging problems.

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.
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First Choice for Accuracy

BRANCH OFFICES AND STOCK . . . BIRMINGHAM* · BOSTON · CHICAGO
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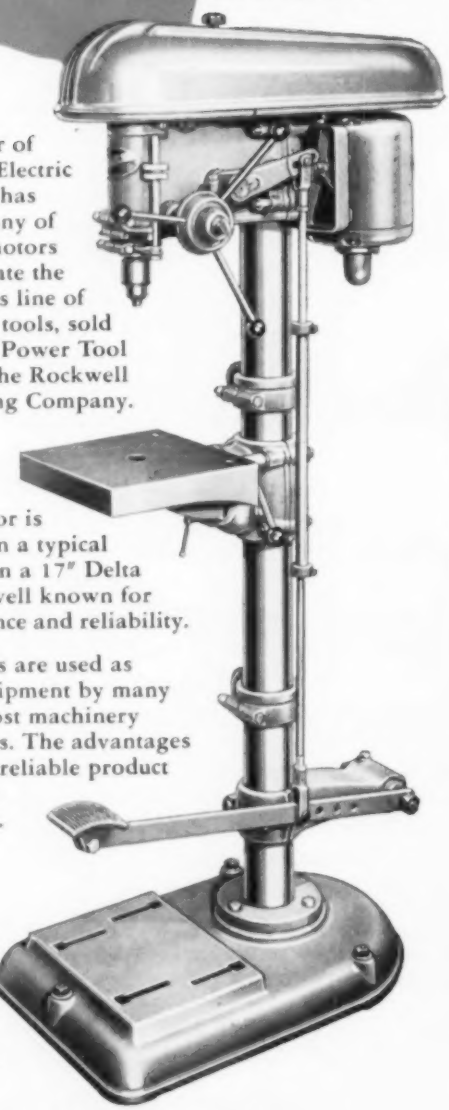
MACHINE TOOLS • CUTTING TOOLS • GAGES

Delta® Tools
get Dependable Power

FROM DOERR* MOTORS



For a number of years Doerr Electric Corporation has furnished many of the electric motors used to operate the world famous line of Delta power tools, sold by the Delta Power Tool Division of the Rockwell Manufacturing Company.

A Doerr motor is shown here in a typical application on a 17" Delta Drill Press, well known for top performance and reliability.

Doerr Motors are used as standard equipment by many of the foremost machinery manufacturers. The advantages of using this reliable product deserve your investigation.

*TRADE MARK

If you have a particular motor problem please let us hear from you.

Visit us at Booth 1955 A.S.T.E. SHOW Philadelphia Apr. 26 to 30.

DOERR Electric Corporation
CEDARBURG, WISCONSIN

USE READER SERVICE CARD; INDICATE A-4-410-1

an ACCO product

Be sure to see the . . .

WILSON "ROCKWELL"* and TUKON Hardness Testers

at the

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Convention Center • Philadelphia

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ACCO *Trade Mark Registered

WILSON MECHANICAL INSTRUMENT DIVISION
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WILSON "ROCKWELL" and TUKON Hardness Testers

230-H Park Avenue, New York 17, N. Y.

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Over 85% of the torque wrenches used in industry are

STURTEVANT TORQUE WRENCHES

Read by Sight, Sound or Feel

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch ounces
...inch pounds
...foot pounds
(All sizes from 0-6000 ft.-lbs.)

Every manufacturer, design and production man should have this valuable data. Sent upon request.

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

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Which is the Clecap?

. . . the one you got the day you wanted it!

All right, we'll skip the arguments about which of these two cap screws is the best . . . though we can prove that one is better because of the Kaufman *double-extrusion* Process and many other factors.

The BIG DIFFERENCE, if you ask long-time Clecap buyers, is the Clecap organization that cheerfully "breaks its neck" to get you what you want exactly when you want it. An astonishing record over the years!

Why not enjoy the comfortable worryless feeling a lot of buyers get by putting all their cap screw needs up to Clecap?

The Cleveland Cap Screw Co.

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VUlcan 3-3700 TWX CV42

WAREHOUSES: CHICAGO • PHILADELPHIA • NEW YORK
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Cleveland
Top Quality
Fasteners

Ferrous and Non-Ferrous

Hex Head Cap Screws—Bright and High Carbon Heat Treated Steel, Brass, Silicon Bronze, Stainless Steel; ¼" to 2½" dia.
Socket Head Cap and Set Screws—Plain and Knurled: ¼" to 1½" dia. Also Flat and Button Head Styles
Flat Head Cap Screws: ¼" to 1" dia.
Fillister Head: ¼" to 1¼" dia.
Set Screws—Square Head: ¼" to 1½" dia.
Milled Studs: ¼" to 1¼" dia.
Place Bolts: ¼" to 1⅛"
Structural Bolts
Tractor Bolts
Facilities to make larger diameters than listed.
Special Hot and Cold Headed Parts

Ask Your Jobber for Clecap!

Originators of the Kaufman DOUBLE EXTRUSION Process

Mark your own symbols, numbers, lettering, on your small parts, tools, identification and name plates . . . easily, simply, quickly . . . tracing from a master with the GREEN ENGRAVER.

Widely used in electronic and plastic fields, in machine tool shops and wherever permanent marking is needed. The GREEN ENGRAVER engraves equally well on metals, plastic, wood, hard rubber and glass.

Fact-filled folder on request . . . showing how economies in costs, labor and time are achieved with the GREEN ENGRAVER.

Routs Models
Profiles Engraves

Etching attachment and other special equipment for industrial uses are available.

Green Instrument Co.
INCORPORATED

394 PUTNAM AVE., CAMBRIDGE, MASS.

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GEORGE L. Detterbeck Quality Tools
SPEED UP
Screw Machine Production

SELECT YOUR NEEDS FROM THIS LIST

We specialize in

CUTTING CAMS
•
HIGH SPEED STEEL AND CARBIDE FORM TOOLS
•
SPECIAL CUTTING TOOLS
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SPLIT DRILL BUSHINGS
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CROSS SLIDE KNURL HOLDERS
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TOOL BITS
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RECESS SWING TOOLS
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Inasmuch as we manufacture cams and tools for the trade we obviously do so on a production basis. As a result we offer:

1. Superior type tools . . . at low cost.
2. Practical design based upon many years of experience.
3. Correct specifications which insures maximum service.

Your tool requirements in our hands is your guarantee of better tools at a great saving.

PROMPT DELIVERIES

Tool making with us is a routine matter. Special equipment . . . skilled hands . . . plus know how, enables us to fill orders in a minimum of time.

SERVICE

Let us quote on your tool requirements. You'll save money . . . even as compared with "home made" tools. Standard circular form tools for B&S and Davenport Machines carried in stock. Immediate delivery.

COMPLETE ENGINEERING

GEORGE L. DETTERBECK CO., Incorporated. 1871 Clybourn Ave., Chicago 14, Ill.
ENGINEERS TO AN INDUSTRY

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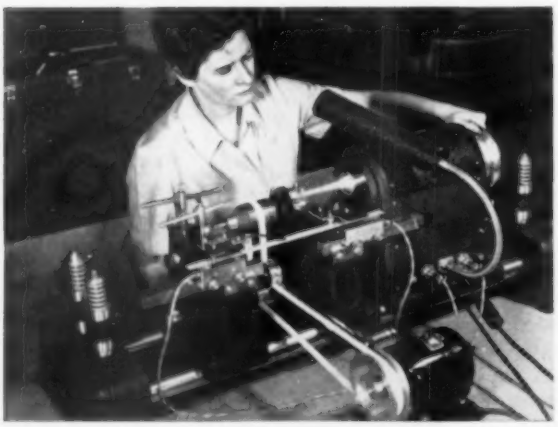
The DYNOGRAPH BALANCER



The DYNOGRAPH—An electronic production type, precision balancing machine for high speed rotors.

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R. B. ANNIS COMPANY

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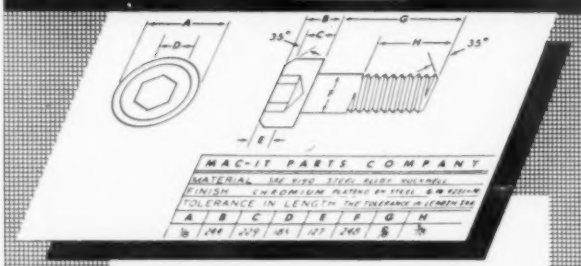
Mac-it DESIGN ENGINEERING at YOUR Service..



MAC-IT SCREW ENGINEERING
Mac-it fastener engineering is available for screw design to suit all types of applications.

SPECIAL SCREW PRODUCTS
Mac-it is geared for small or large runs of screws with special design or strength characteristics.

DISTRIBUTOR SERVICE
Hundreds of distributors from coast to coast insure prompt attention to all screw requirements.

MAC-IT SCREW DEPARTMENT
STRONG, CARLISLE & HAMMOND COMPANY
1392 W. 3RD. STREET • CLEVELAND 13, OHIO
Manufactured by Mac-it Parts Co., Lancaster, Pa.

Bring your special fastener problems to Booth 410 • A. S. T. E. SHOW PHILADELPHIA APRIL 26-30

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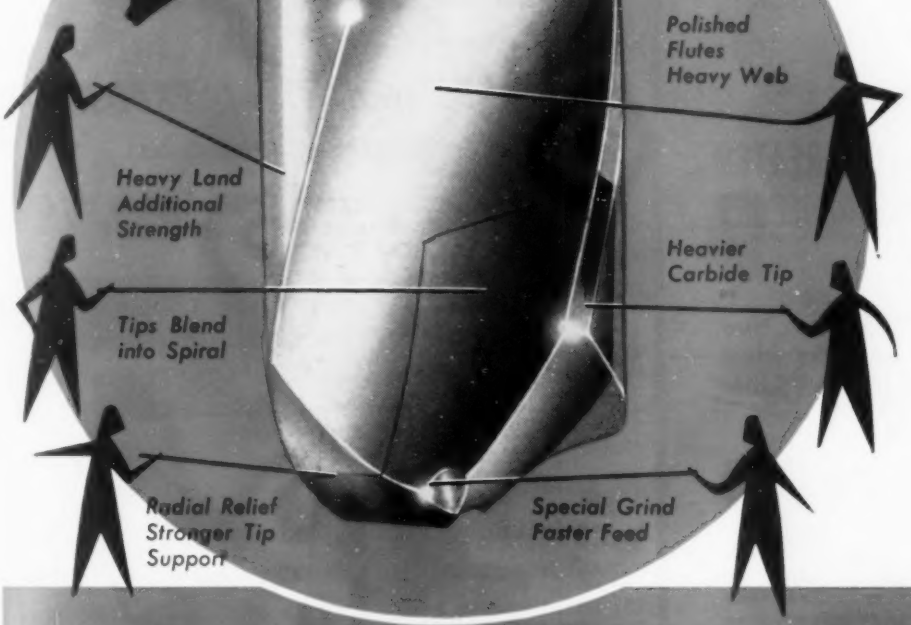
For Every Carbide Drilling Application There's a STANDARD SUPER DRILL

NEW and really super!


Polished Flutes Heavy Web
Heavy Land Additional Strength
Heavier Carbide Tip
Tips Blend into Spiral
Radial Relief Stronger Tip Support
Special Grind Faster Feed

Six points of superiority—Result of two years' research. Extensive tests indicate it's the most durable and the fastest cutting carbide twist drill developed to date. Feeds as high as 8" per minute in cast iron have been obtained. Stocked in fractional, wire and letter sizes for your convenience.

NEW LOW PRICES

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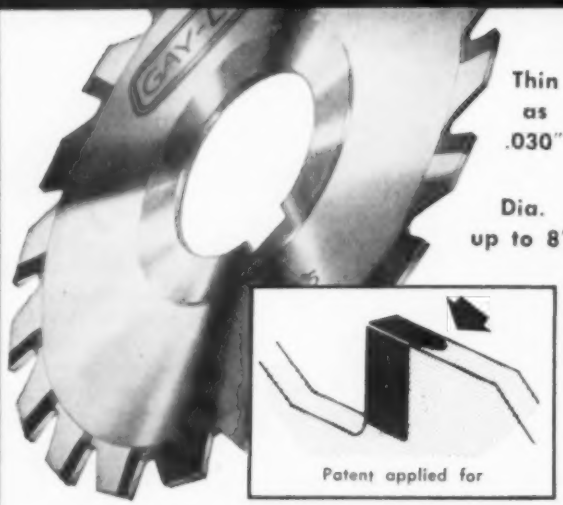
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-413

CARBIDE TIPPED

THINSAW

FOR EVERY INDUSTRY



CIRCULAR SEAT GIVES GREATER BRAZE AREA—BETTER TIP SUPPORT

This exclusive Gay-Lee carbide tipped saw design has completely changed the slitting, slotting and sawing picture. Now carbide tips stay in and run-out is eliminated. You get the full benefit of carbide's faster cutting ability.

WHAT IS YOUR SAW PROBLEM?

We are specialists in carbide saw design and manufacture. We have solved some tough jobs and some big ones. Can we help you?

Hub Saw | Thinsaw | Small Saw

Carbide teeth profile ground on Special Order

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GAY-LEE COMPANY

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Punches and Dies

. . . for foot and power presses

Standard Punches and Dies of all sizes and shapes in stock—or made promptly to order. Also Adaptors and Die Shoes to convert your press. For power, foot or hand operation.

Round, square, rectangular, slotting, notching, louvre, angle, multiple, knock-out and other shapes. Precision made from high grade tool steel. *LET WARD PUNCH AND DIE FOR YOU!*

• *Send for free illustrated catalog No. 154-AC—NET PRICE SHOWN! What are your punch and die needs?*

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PHILADELPHIA, APRIL 26-30

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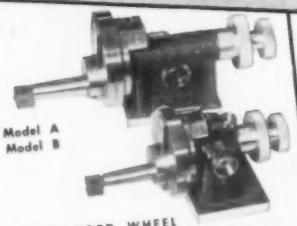
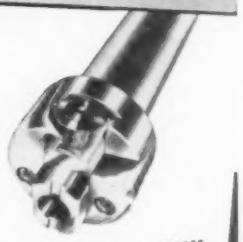
Improve Your Operating Efficiency, Quality and Profits with these LAST WORD Metal-Working Products!

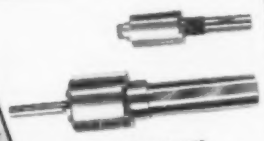


LAST WORD WHEEL DRESSERS FOR RADIUS AND TANGENT ANGLE DRESSING — AVAILABLE IN 3 MODELS
MODEL A—For grinders using wheels up to 20" dia **MODEL B**—For small model surface grinders with 7" max wheel dia **MODEL C**—Compound Dresser, will compensate for compound angles involved in grinding form tools.

Model C



SAMSON "Heavy-Duty" OFFSET BORING CHUCK—Has positive centering feature for drilling and milling operations. Complete accessories available.



Send for complete data

GRAY-GRIMES FLOATING DRIVER—For reaming, tapping, valve seating and similar operations. Can be supplied with standard or special shanks and adaptors.

GRAY-GRIMES AUTOMATIC STEADY-REST FOR O.D GRINDING—Permits grinding complete length of shaft maintaining constant pressure against work-piece as stock is removed.

Mfg'd by Gray-Grimes Tool Co.

LAST WORD sales company

18500 MT. ELLIOTT (Dept. F) • DETROIT 34, MICH.

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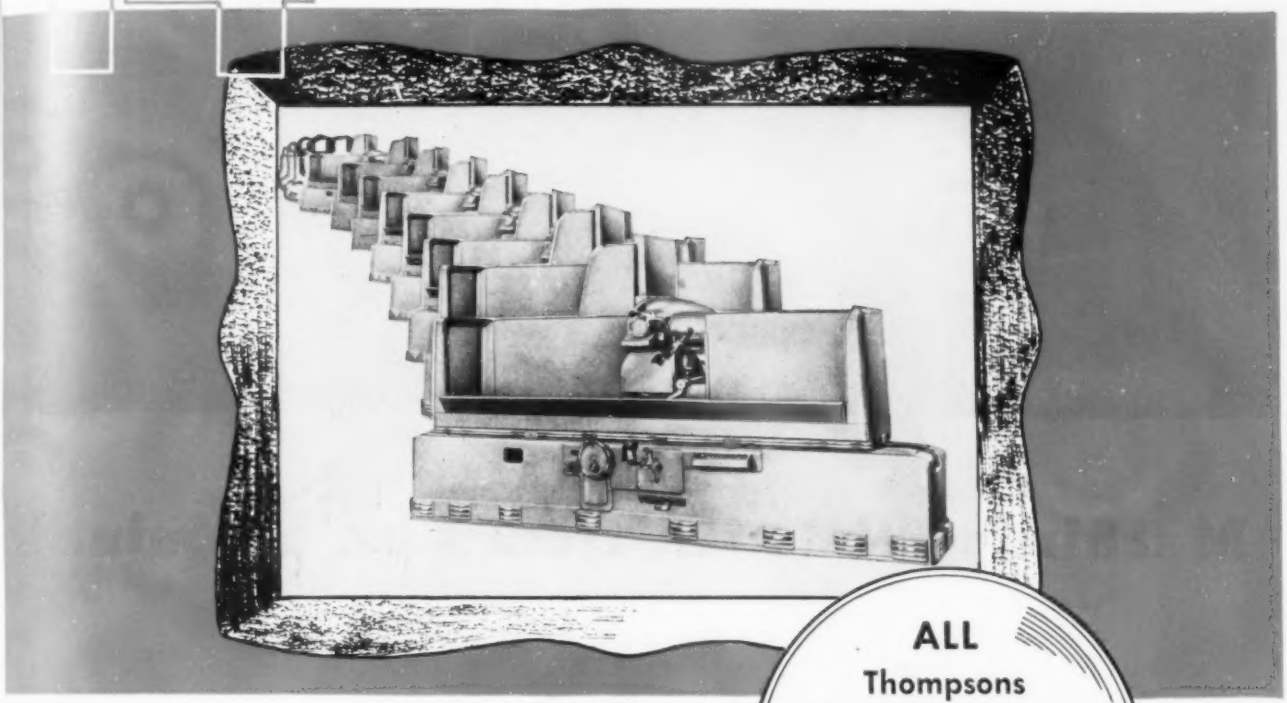
LOOK CLOSELY AT THIS PICTURE
OF GRINDER PRODUCTION AND SEE WHY...

14 is a lucky number

for a manufacturer requiring precision grinding



ALL
Thompsons
operated continuously
with much
LESS
DOWNTIME

that's why

it will pay you
to invest in

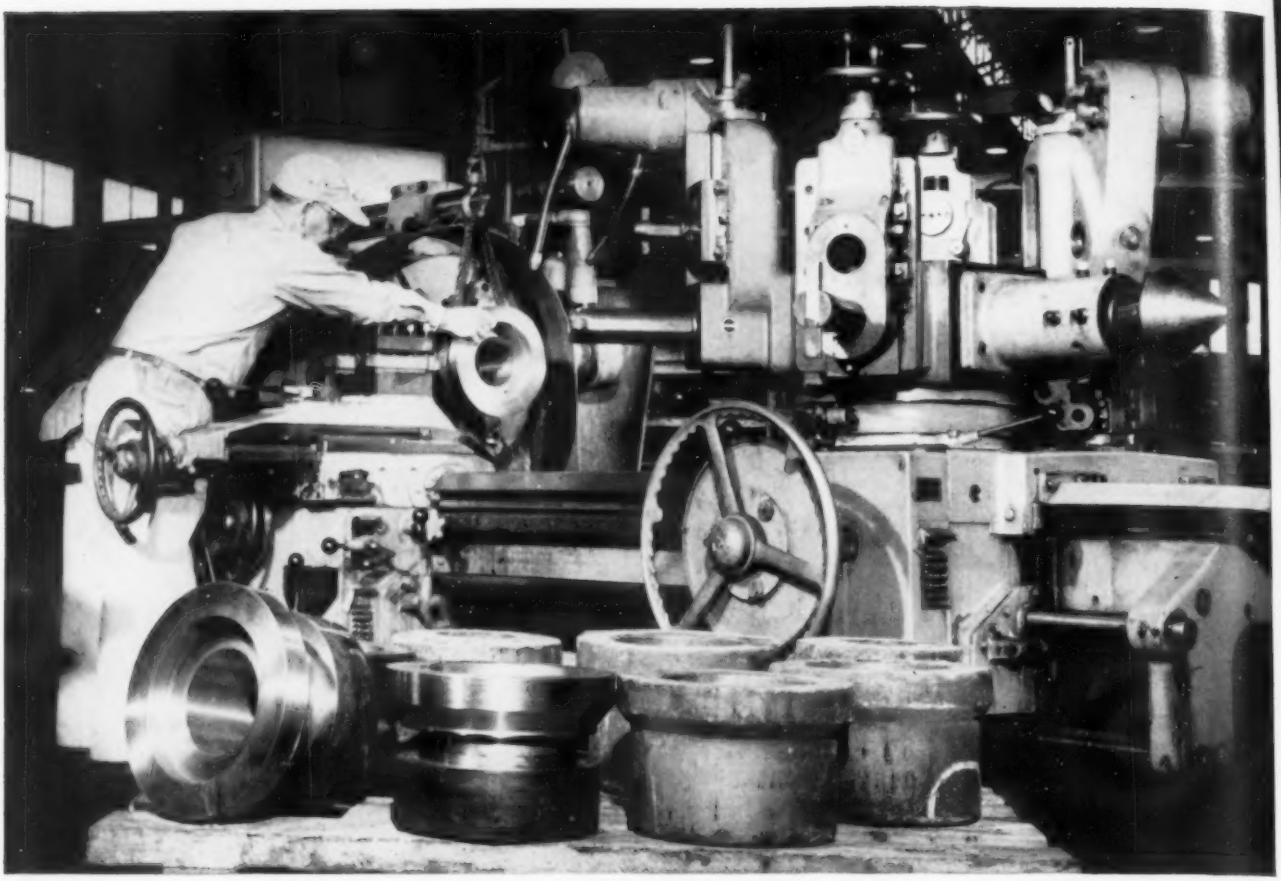
Thompson Grinders

After twelve years continuous manufacture of precision ground products, ten Thompson Surface Grinders proved so efficient and economical that this manufacturer ordered four more machines.

Thompson Grinders are available in a wide range of types and sizes from 6" x 18" to 72" x 384" to meet all production, special or tool room grinding requirements. The Thompson line includes machines from giant Hydrial Way Grinders to automatic Truform Jet Blade Contour Grinders, Dual Rotary Grinders and Broach Grinders.

CONTACT THOMPSON TODAY FOR HELP WITH YOUR MACHINING PROBLEMS

THE THOMPSON GRINDER COMPANY
Springfield, Ohio



Machining time cut from 1 hr. 54 min. to 30 MINUTES!

HERE'S A GOOD EXAMPLE of what happens when a part is machined on the *right* machine with the proper tooling!

The machine was a new Warner & Swasey 4-A Turret Lathe installed in 1953 at the Emsco Manufacturing Company plant at Houston, Texas. It replaced an 8-year-old saddle type turret lathe.

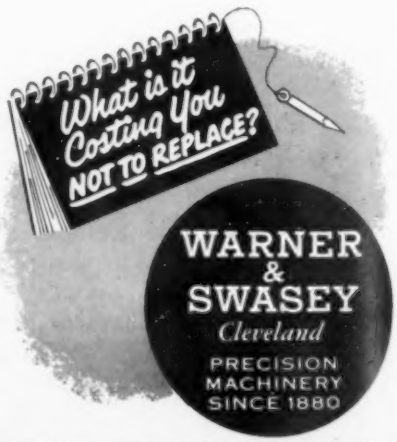
Previous time for machining a large steel forging was 1 hour 54 minutes. This involved boring a hole to .001" tolerance, facing the end, a two inch turning operation on the 11" O.D., single pointing a 30° angle two inches long, grooving a 1½" wide square groove on the O.D., and breaking the corners.

After the job was transferred to the new Warner & Swasey, and following the setup and tooling recommendations of our Field Engineer, *the operation was completed in 30 minutes!*

Another operation transferred to this Warner & Swasey was machined in one-fourth the previous time! On a third part the operator produced 13 hours' work in one shift!

Translating these time savings into production, Emsco reports that production of parts transferred to the Warner & Swasey has been increased by 32%. Operators like the machine's ease of handling and its ability to hog off metal.

This is a record of just one machine, but it emphasizes the profit possibilities open to you when the job is done on the *right machine*, properly tooled, and job-analyzed by a turning specialist . . . a Warner & Swasey Field Engineer. Call him in on your replacement problem. He's a good man to work with.



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

UNION

ANNOUNCES

COUNTERBORES

WITH INTERCHANGEABLE PILOTS

Out of significant knowledge gained in making a wide variety of high precision cutting tools comes Union's High Speed Steel Counterbore with Interchangeable Pilots. Available in standard and aircraft designs. Call or write your Union Distributor for full information.

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

End Mills **Milling Cutters** **Gear Cutters** **Twist Drills** **Hobs** **Reamers** **Carbide Tools**

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

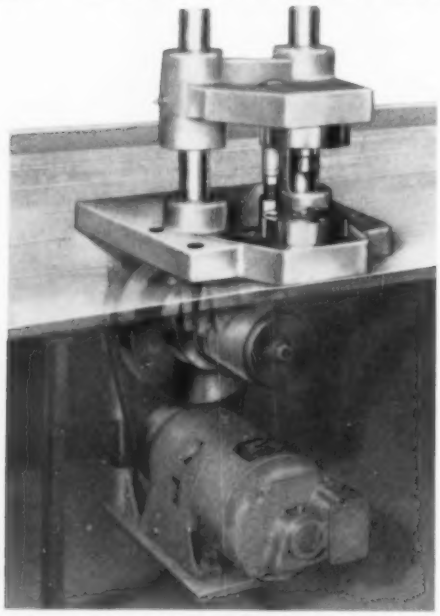
YOUR DISTRIBUTOR IS READY TO SERVE YOU PROMPTLY FROM FULL STOCKS

Introducing . . .

the SWANSON POWER-DI PRESS UNIT

A precision bench press that makes it possible to:

Cut Die Costs 50%



This new concept in bench punch presses eliminates the use of die sets and reduces die makers' time substantially. The press itself serves as a precision die set, and ready-made punch and die retainers eliminate making special die components. The POWER-DI unit can also be used for existing conventional dies.

Model shown can be mounted to any bench by making suitable opening for self-contained motor and drive assembly attached to lower bolster of press. Exposed working section of press takes little more room than ordinary die set, provides maximum ease of operation and efficiency. Ideal for group bench mounting to handle a series of operations and where working space is a factor. Other models are available for pedestal floor mounting, and also for attaching to Swanson Turret Indexing Units.

POWER-DI units are furnished with 1 ton capacity — 1¼" stroke — 3" to 7" shut height adjustment — 200 strokes per minute.

. . . See these
PRECISION PRODUCTS by SWANSON
Booth 1968 ASTE Show

Turret Indexing Units
Turntable Units
Feeding Hoppers
Memory Devices for automatic machines
V-Liner Inspection Units and Concentricity Checking Fixtures

Engineers and Builders of Special precision machinery

Write for Bulletin PD-4

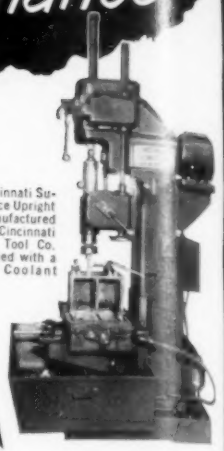
SWANSON
TOOL & MACHINE PRODUCTS INC., ERIE, PA.

Quality since 1919

USE READER SERVICE CARD; INDICATE A-4-418-1

Cut Maintenance

TO A MINIMUM WITH A RUTHMAN GUSHER COOLANT PUMP



This Cincinnati Super Service Upright Drill manufactured by the Cincinnati Bickford Tool Co. is equipped with a Gusher Coolant Pump.

Check the features of every Ruthman Gusher Coolant Pump. They assure *you* of absolute minimum maintenance on your Gusher Pumps.

- Totally enclosed drip-proof motors.
- Pre-lubricated heavy-duty ball bearings.
- No packing or priming necessary.
- Electronically balanced rotating assembly to cut vibration to a minimum.
- No metal to metal contact within the pump.

Always specify Gusher Coolant Pumps.

THE RUTHMAN MACHINERY CO.

1810 READING ROAD CINCINNATI, OHIO

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SAVE UP TO 85% ON GOVERNMENT SURPLUS

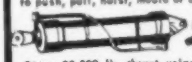
MAGNI-FOCUSER

Has fine ground lenses of optical glass. Neutralizes eye strain from close work. Binocular design gives third dimensional vision. Allows freedom of both hands. Wear over glasses. Plastic frame with adjustable headband.

SIZES: 20" focal lgth. 1½ power — 14" focal lgth., 1¾ power, 10" focal lgth., 2½ power; 8" focal lgth., 2½ power . . . . . price each ONLY **10.50**

HYDRAULIC EQUIPMENT

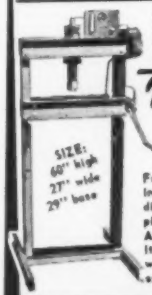
We stock over 100,000 Hydraulic Cylinders in 106 different types and sizes. These can be adapted wherever tremendous power is needed to push, pull, hoist, mould or drive, etc.



SPECIAL

Gives 20,000 lb. thrust using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on a low pressure air system. Has 4" bore; 18" stroke; 30½" long. Ideal for shop. Part No. 29 **USED 29.95** **NEW 43.95**

OTC TOOLS



See our complete line. Pullers for Gears, Bearings, Wheels, Pulleys, Bushings, Shafts, etc.

NEW 10 TON HYDRAULIC PRESS

SIZE: 60" high 27" wide 29" base

Use this Press in the Shop or take it with you on the job. Frame is 4" welded channel iron. Has 4½" stroke, 2½" diam. ram. Valve operates piston in both directions. Adjustable platform. Positive power Hand Pump with handle. 2000 PSI pressure gauge. **129.00**

HYDRAULIC HAND PUMP

Operating pressure 1500 PSI. Cap., 1.5 cu. in per complete cycle . . . **12.75**

ACCUMULATORS

A-2B FLOATING PISTON TYPE — 4"x 18" Built to stand 2,000 PSI **12.75**

A-5 VICKERS — 10" dia. Ball type. Built to stand 2000 P.S.I. **24.50**

NOTE: Stocks include bargains in Hydraulic Pumps — Valves — Motors — Boosters — as well as Oil, Water and Fuel Pumps, etc.

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320 PAGE-1954 EDITION

Packed with SENSATIONAL VALUES in GOV'T SURPLUS — FACTORY CLOSE-OUTS — and GENERAL MERCHANDISE. Fully priced and illustrated. Thousands of items in Machine and Industrial Tools — Hydraulic Equipment such as Cylinders, Pumps, Valves, Meters, Fittings, etc. Bargains in Electric Motors, Generators, Blowers, Parts, etc. Also Hand and Power tools, Precision Instruments, Bearings, Hose Clamps, Winches, Foam Rubber, Microscopes, etc. ALL AT PALLEY BARGAIN PRICES — PRICED TO SELL!

Palley SUPPLY CO. 2263 E. VERNON AVE., Dept. TE-4 LOS ANGELES 58, CALIF.

Pay by M.O. or check. P.O.'s accept. from D&B firms. C.O.D.'s deposit with C.O.D. Prices FOB Los Angeles

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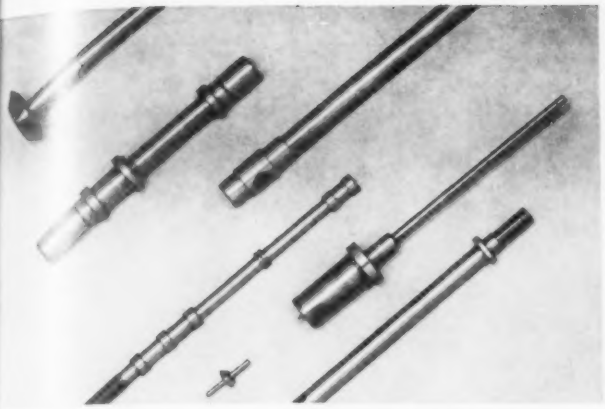
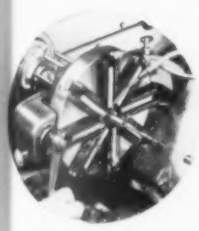


How to MAKE MORE MONEY on parts like these!

If you make small parts 1" O.D. or less you can:



- Save up to 80% on tooling costs!
- Reduce set-up time!
- Produce up to 5 times more parts per day on low cost lathes!
- Save your working capital!

How? RENT A ROTO-HEAD!

See it in action at the ASTE Exposition, April 26-30, Philadelphia, Pa.

If you can't attend drop us a card for complete details on ROTO-HEAD!

GENERAL ROTO COMPANY

847 EAST 60TH STREET • LOS ANGELES 1, CALIFORNIA

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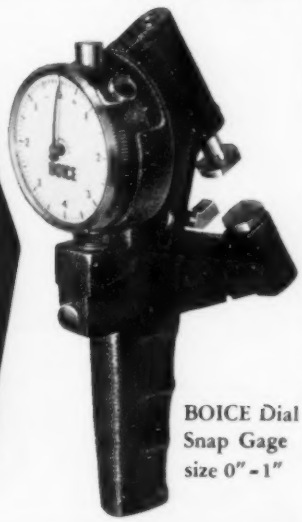
new BOICE dial snap gage

REDUCES OPERATOR FATIGUE



BOICE Dial Snap Gage size 0"-1"

The BOICE Dial Snap Gage has been carefully designed for optimum balance and legibility with operator fatigue an uppermost consideration. The gage is available in sizes 0" to 4" each with a 1" range. It can be supplied with a selection of indicators.

Write for Bulletin 6B

BOICE MANUFACTURING COMPANY, INC.

STAATSBURG, NEW YORK

DIAL GAGES BY BOICE "INDICATES QUALITY"

VISIT US AT BOOTH 341

USE READER SERVICE CARD; INDICATE A-4-419-2

NOW Clutch Operated Models

extend the applications for

Swanson TURRET INDEXING UNITS

Swanson Series TC Unit shown with optional mounting brackets.

By providing a "packaged" intermittent-motion chassis, Swanson Turret Indexing Units save time and money in designing and building special automatic machines for precision production operations on small and medium parts.

SWANSON series TC indexing turrets differ basically from the accepted series T units only in the solenoid-operated clutch drive provided. They incorporate the same Swanson cross-over cam and locking device to assure harmonious indexing and accurate, positive positioning at all work stations. They are available in a wide range of turret diameters and work stations, with full provision for mounting operational devices of all types.

The new clutch-operated models have been developed to handle applications requiring a high variable of infinite work cycles . . . or where it is desirable to have the operator control the indexing cycles by push-button controls. Limit switches may also be provided to prevent indexing before completion of any operation cycle. Without obligation, Swanson engineers will be glad to suggest applications of these units and accessories to you. In over a third of a century, Swanson-made machines have improved quality and quantity in hundreds of manufacturing operations.

Write for Bulletin TC 4

. . . See these **PRECISION PRODUCTS by SWANSON**

Booth 1968 ASTE Show

POWER-DI Press Units
Turntable Units
Feeding Hoppers
Memory Devices for automatic machines
V-Liner Inspection Units and Concentricity Checking Fixtures

Engineers and Builders of Special precision machinery

SWANSON

TOOL & MACHINE PRODUCTS INC., ERIE, PA.

Quality since 1919

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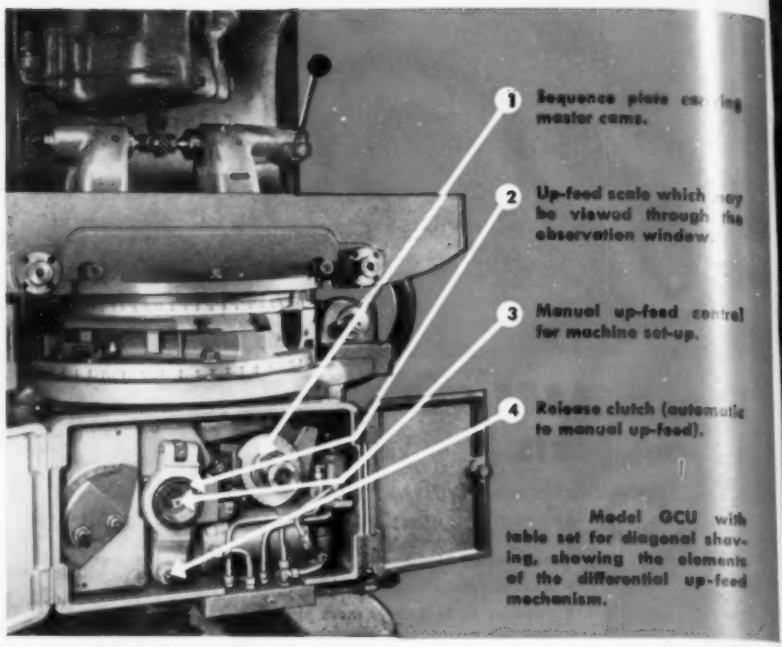
GEAR SHAVING NOW

Much Faster and More Flexible


1 Sequence plate carrying master cams.
2 Up-feed scale which may be viewed through the observation window.
3 Manual up-feed control for machine set-up.
4 Release clutch (automatic to manual up-feed).

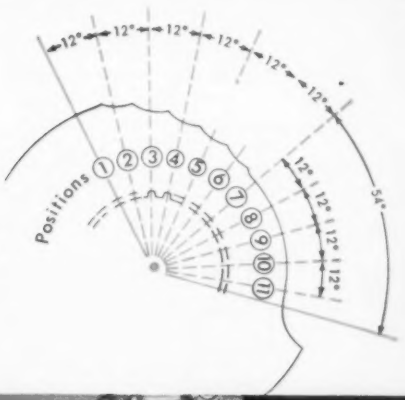
Model GCU with table set for diagonal shaving, showing the elements of the differential up-feed mechanism.

When Automatic Differential Up-feed and Conventional Crowning were added to the Red Ring Model GCU, shaving speed, flexibility and economy were all significantly increased.

AUTOMATIC DIFFERENTIAL UP-FEED

This efficient device provides for the first time an automatic cycle applicable to both diagonal and conventional shaving. This cycle is controlled by an eleven-position master cam. Included are backlash take-up, infeed cutting strokes, idling strokes and return to unloading backlash. The entire cycle or any portion of it may be used depending on job requirements.

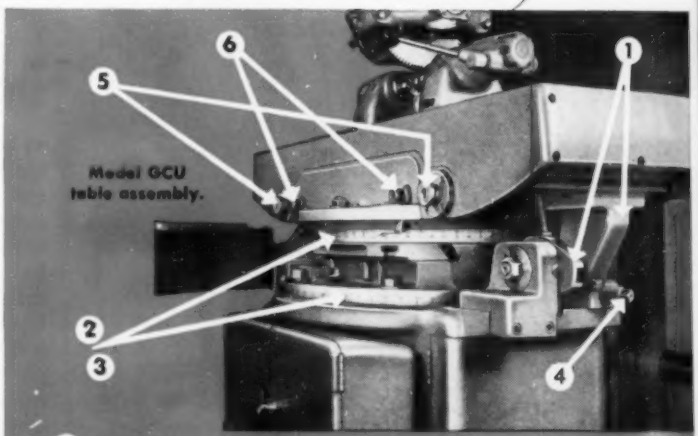
The cam itself does not actuate knee movement. It is strictly a stepped gaging device. Consequently every knee movement is positive, extremely precise and very fast. No danger of operator's errors. Perfect accessibility for fast loading and unloading.



One of the two control cams carried by the feed unit sequence plate.

CROWNING

Gears being shaved conventionally can be crowned by rocking the table about a central pivot during the automatic cycle. The cam controlling the rocking movement is located on table centerline to avoid any tendency to twist. This device also provides for taper shaving.



1. Crowning cam and bracket.
2. Scales for diagonal shaving set-up.
3. One of 2 tapered shot bolts used to realign table and ways for conventional shaving.
4. Lock pins when removed, permit table to rock for conventional crowning.
5. Bolts operated from the front of the machine actuate tapered wedges to lock table to the ways.

Write for Bulletin S53-7 for full details.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

6585

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

IN A HOLE?

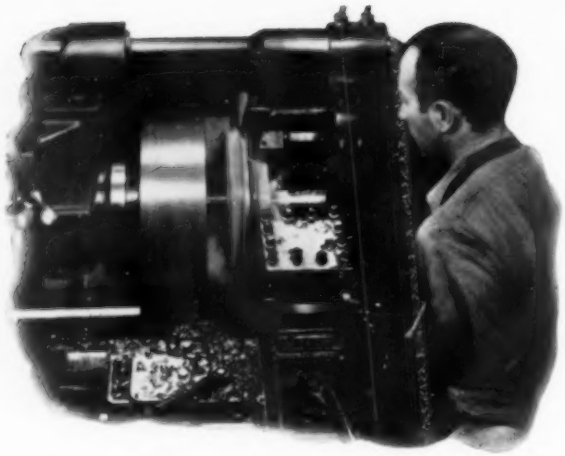
Here's a tough threading job that could be done only with an "Acorn" Die easily. The compact holder and protruding die lands permit entering the counter bored hole and cutting threads right down to the bottom.

Only a holder body, a cap and a one piece die! Put them together and you have a high speed production tool that is really rugged, accurate and dependable.

Cutting sizes #0-80 to 1½″-12.″ Holders for many types of machines.

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.



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In a complete range of tungsten, moly, cobalt, and high vanadium types

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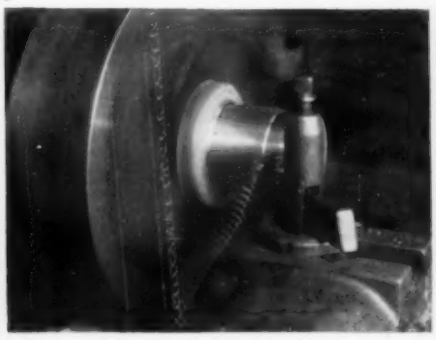
SUPER PANTHER
PANTHER SPECIAL
ML, LXX, SUPER DBL
DBL-3 AND DBL-2

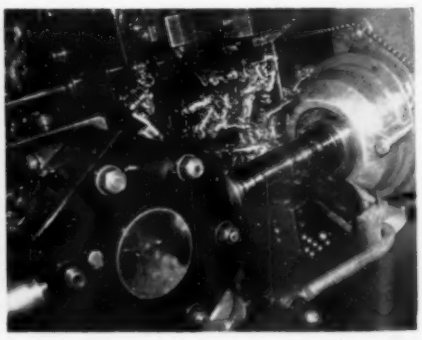
Cut to length . . . bevelled both ends . . . heat-treated to perfection. Just shape the point and you're all ready to go . . . A-L Tool Bits are the last word in convenience.

Made in a complete range of tungsten and moly high speed steels . . . including the new cobalt and high vanadium types that offer superior red hardness, wear-resisting and cutting properties.

Furnished in Standard finish or the popular Ground finish which is extremely accurate in dimension and free from decarburization and scale.

For real Johnny-on-the-spot service on the finest tool bits obtainable, call your local A-L office or distributor . . . TODAY! • *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*





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AL
FINE TOOL STEELS
SINCE 1854

THREE BROACH USERS TELL WHY

INDUSTRIAL POWER . . .

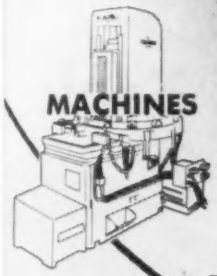
. . . "We like Colonial broaches because of their accuracy, dependability, and service rendered by the company and their representatives . . ."

ELECTRONICS . . .

. . . "It has been our experience that Colonial broaches have given us most satisfactory results. Quality, workmanship and tolerances furnished on these broaches are a definite asset to our company . . ."

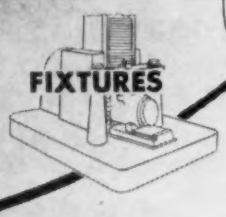
COAL MINING EQUIPMENT . . .

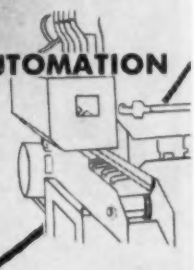
. . . "We are well satisfied with the performance of Colonial broaches in regard to tool life, low maintenance, and close tolerances, which they must hold. A big factor is that in the event of a rush or a break-down job, we have learned to depend on Colonial getting broaches to us very quickly, thus avoiding long shutdowns . ."

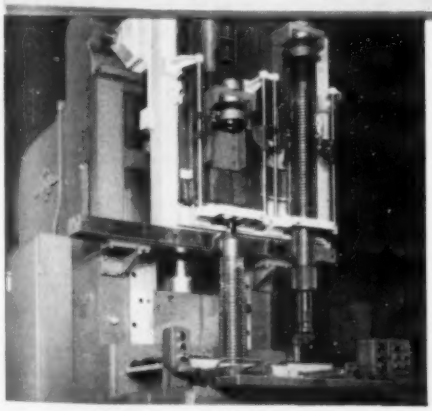


COLONIAL
BROACH CO. DETROIT 13

Unified Broaching







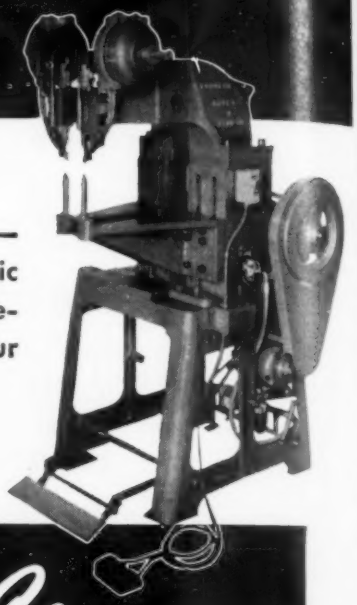
NO BROACH HANDLING - ½ *the Work Handling*

A big gain in efficiency as well as a reduction in cost results when there is no broach handling between passes in the two-step broaching of large parts. The Colonial dual sliding broach handling support handles the two broaches automatically and permits two-pass broaching with only one handling of the work piece.

The entire cycle through both broaching passes is automatic on this Colonial 50-ton, 72-inch stroke, pull-down broaching machine.

This is a Colonial Unified Broaching Installation.

TUBULAR OR SPLIT RIVETS
RIVETING MACHINES



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Wide selection of sizes and metals for all sorts of applications. Also, Electrical Contacts, Capacitor Rivets, and Specialties for Electronic Work.

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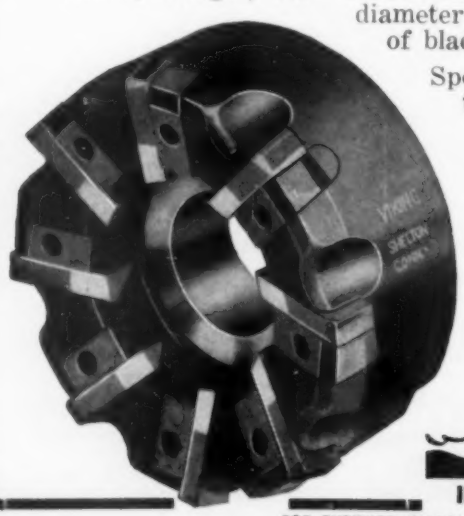
True dual adjustment of blades with no auxiliary shims, wedges, etc. Cutter can maintain original diameter and width thru life of blades.

Special designs of Multiple Cutter Gangs to customer specifications.



CARBIDE TURNING TOOLS WITH MECHANICAL CHIP BREAKER

Separate chip breaker block and tool tip simultaneously locked in tool holder with one locking device. Insures no wedging of chip under breaker to fracture the tool.

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SHELTON, CONN.

INSERTED BLADE SINGLE POINT TOOLS AND MILLING CUTTERS

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We hope you get to Convention Hall, Philadelphia the week of April 26th. If you do, please visit us and see these leading Swiss and German machine tools in operation.

NEW—universal milling machine

NEW—vertical turret lathe

NEW—optical jig borer

NEW—drum-type turret lathe

NEW—multi-spindle hydro-copying milling machine

NEW—engine lathe

NEW—crankshaft balancing machine

NEW—swiss automatic with drum turret

NEW—cylindrical grinder

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DRILLS Radial, universal

AUTOMATIC FORMING MACHINES
Wire and strip, washer

WIRE STRAIGHTENING AND CUT-OFF MACHINE

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Mechanical comparator, electrical surface finish comparator, bench micrometer

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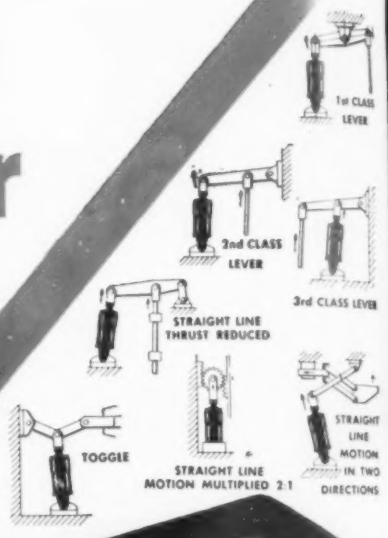
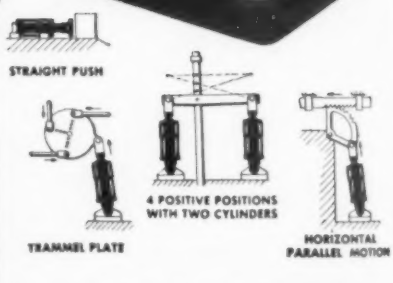
...how can I use HANNA® cylinder power in my machine tools and equipment?



here are basic Cylinder Powered MECHANICAL MOVEMENTS that can be put to work for YOU!

IF YOU HAVE a push, pull, lift, press, clamp or control problem, Hanna Cylinder Power can be the answer. The mechanical movements here illustrated may suggest ways Hanna Cylinders can be used to simplify the actuation and control of machines or equipment and to replace or reduce manual effort.

In the majority of cases, you can select a standard cylinder model to meet your specific requirements from the broad Hanna Hydraulic and Pneumatic lines. Regardless of whether you choose a "standard" or "special" the Hanna label assures you of quality developed through fifty years of concentration on cylinders and their control valves!



See Cylinder Power In Action . . .

Visit the Hanna Booth No. 1417

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"Cylinder Power in Action" is described in new Bulletin 255. Write for it today!

Hanna Engineering Works

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HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

Have a personal demonstration at the A.S.T.E. Exposition in booth

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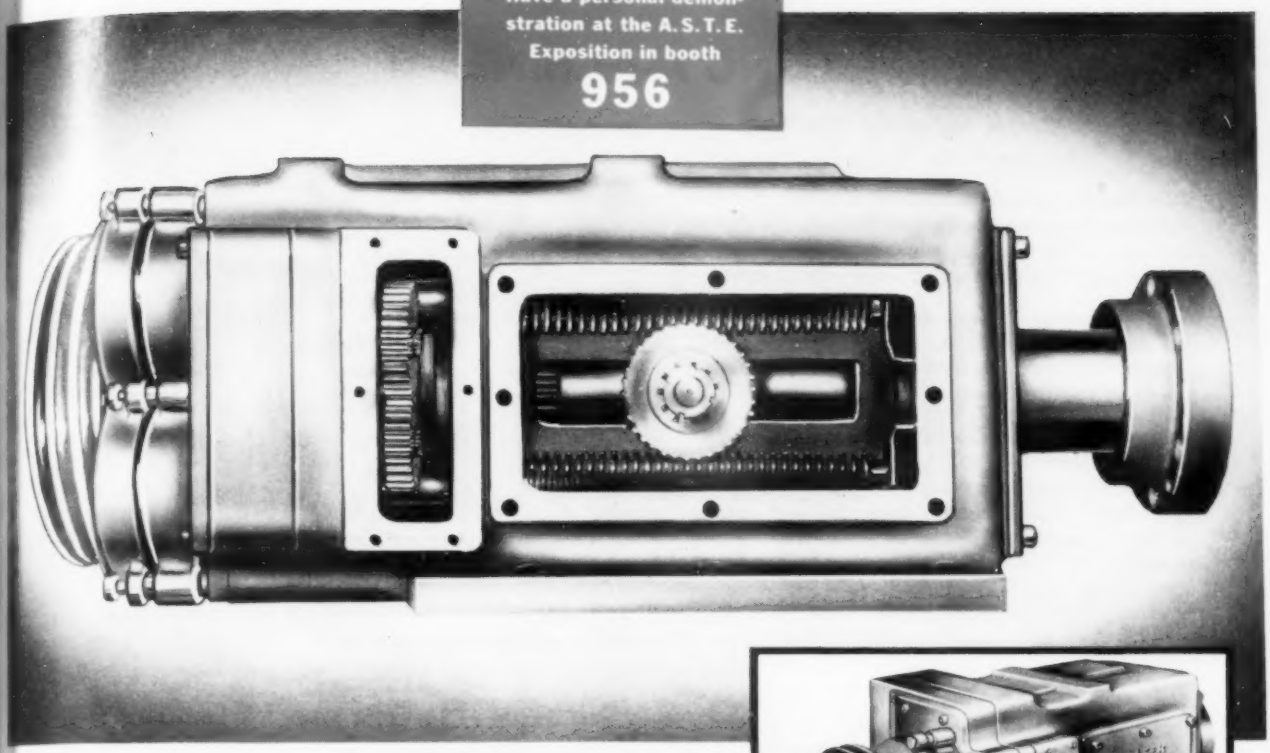

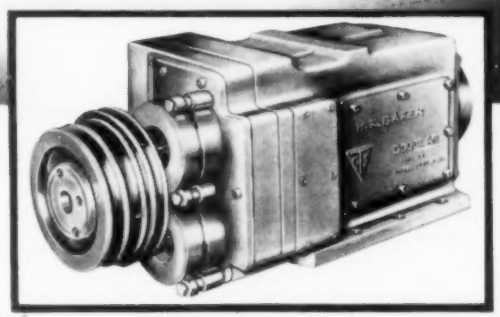

Developed and patented by H. K. Baker

Solve your Drilling, Tapping, Boring, Turning and Facing problems with the

DOUGLAS DIFFERENTIAL DRIVE UNIT

A Product of PRODUCTIONEERS FOR INDUSTRY

The Douglas Differential Drive Unit is a mechanical feed mechanism incorporating twin lead screws and a worm gear. It offers such outstanding features as ABSOLUTE UNIFORM FEED RATE . . . LONGER TOOL LIFE . . . WIDE RANGE of FEED RATES . . . MAGNETIC CLUTCH and BRAKE UNIT . . . NO SLIP RINGS . . . TRAVERSE, RETURN, SKIPS . . . NO WARM-UP TIME . . . CARBIDE DRILLING . . . RUGGED QUILL.

The Douglas Differential Drive Unit is available in two models—BU-SR-3D; BU-GSR-3D

Spindle and feed of model BU-SR-3D are individually driven by separate sheaves, each independent of the other.

Model BU-GSR-3D is also equipped with separate sheaves to spindle and feed mechanism. There is, however, a geared reduction to the spindle in addition to the sheave ratios. This model is ideal for single spindle operations using larger diameter drills on tough alloy steels.

For more accuracy on machining operations, use the Douglas Differential Drive Unit.

HI-HELIX Milling Cutters

Users claim they get reduced cutter breakage, improved workpiece finish, better size control, faster cutting and reduced down-time for tool changing. Especially recommended for *Titanium alloys, Nimonic 80* and *Inconel.*

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A Standard Machine
Designed for Variety Production

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Any number of drilling units up to eight may be employed. the units being movable not only through 360 degrees on the circular table but also movable endwise on riser plates to meet the requirements of the part being drilled.

The machine may also be used for tapping operations with Govro-Nelson Tapping Units. It has a range of 1/32″ to 3/8″ on drilling operations and 0-80 to 3/8-16 on tapping operations, depending on material and spindle speeds. A single, momentary contact start-button causes all units to operate simultaneously.

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If you are interested in reducing the cost of your radial drilling and tapping operations, write for price and dimensional data.

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Automatic DRILLING UNIT

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Machinists of Precision Parts for 30 Years
1933 ANTOINETTE DETROIT 8, MICH.

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FROM PYGMY 0 to GIANT 5

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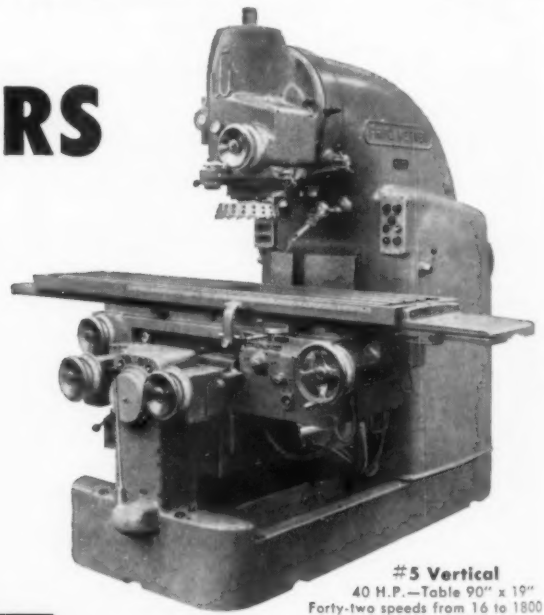
Precision Machines for Tool Room or Production Line.



#5 Vertical
40 H.P.—Table 90" x 19"
Forty-two speeds from 16 to 1800 RPM
Fifty feeds from 9/32" to 80" per Min.

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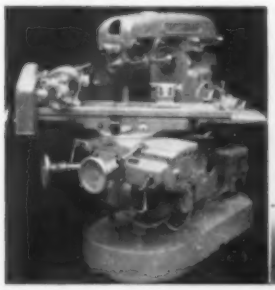
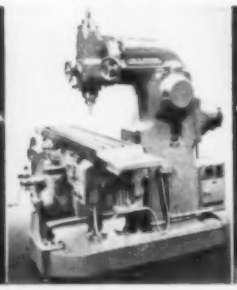
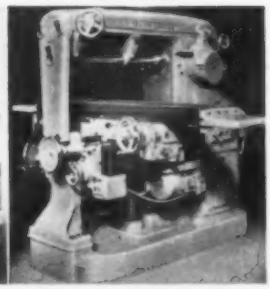


#3 VERTICAL



#4 PLAIN



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MARAG MACHINERY CORP.
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SOLENOID PILOT OPERATED CONTROL VALVE

by VALVAIR

DESIGNED AND BUILT TO J. I. C. STANDARDS

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- **Fully Enclosed**
- **Integral Junction Box**

The Valvair line broadens again — with Speed King's exclusive features. All parts are totally enclosed. The Speed King will operate submerged in water or buried in sand. Simplicity! — only two moving parts. Molded coil — no wear or shorting out. 20,000,000-cycle life and more. Speed King is industry's most rugged and compact valve.

Other features: for pressures from 35 to 200 p.s.i. pneumatics, hydraulics, vacuum; complete line—2-way, 3-way, 4-way and 4-way-5-port (2-pressure) models; foot or sub-base (manifold) mounting; pipe sizes —¼", ⅜", ¾" and 1".

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JIG GRINDING ACCURACY *guaranteed**

INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3⅛" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

*Dependably accurate to "tenths"

Vulcanaire

It's built by toolmakers for toolmakers

VULCAN TOOL CO., 7300 LORAIN ST., DAYTON 10, OHIO

USE READER SERVICE CARD; INDICATE A-4-430-1

"TRI·FLU·MIC"

$65.00

A direct reading micrometer for three-fluted tools

●This Tri-Flu-Mic completely overcomes the usual problems presented in measuring three-fluted tools.

It accurately measures the diameter of three-fluted end mills, taps, reamers, etc., as easily and quickly as a standard micrometer measures a square bar. Exact diameters are read directly in .001".

It also may be used to determine the true roundness of cylindrical work.

The Vee anvil is 3/16" wide. Measuring surfaces of both anvil and spindle are hardened tool steel for long accurate service. Frame and head are finished in Silver Mist chrome. Graduations are black for easy reading. Normal size range is 3/32" to 1". Other sizes as well as micrometers with tungsten carbide measuring surfaces are also available. Write for name of nearest jobber and new Tumico catalog.

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See complete line including many new

TUMICO

PRECISION TOOLS

At Booth 328 at ASTE in Philadelphia

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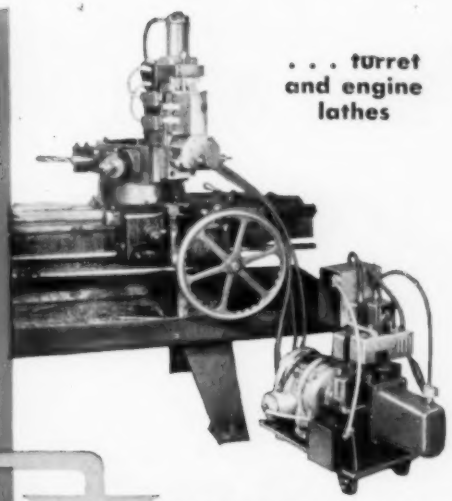
Roll accurate threads in any of these machines with Salvo thread rolling ATTACHMENTS



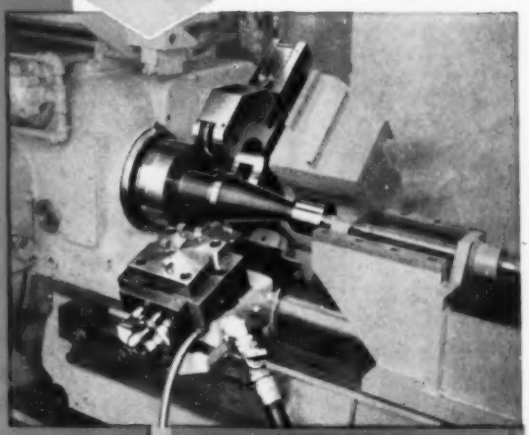
. . . turret and engine lathes

engineered for

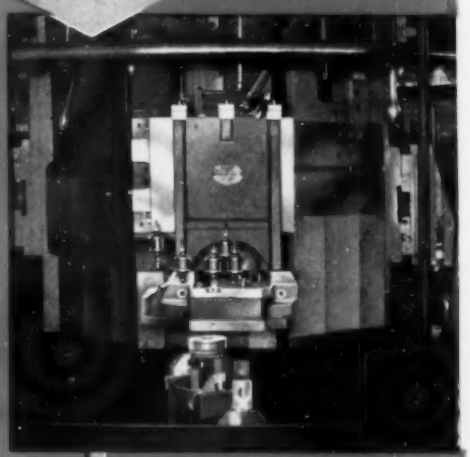
If your threading jobs involve screw machines, turret or engine lathes, Bullard Mult-Au-Matics, or high speed automatic lathes — Salvo Thread Rolling Attachments will help you produce accurate, stronger threads with less time and money.

Salvo Attachments are designed to mount in the machine's normal tool position—*allowing both threading and machining in the same set-up.* Since no separate re-chucking operation is required for threading, exact concentricity with other diameters is maintained and work time is reduced. Pitch diameters are controllable to 0.0005".

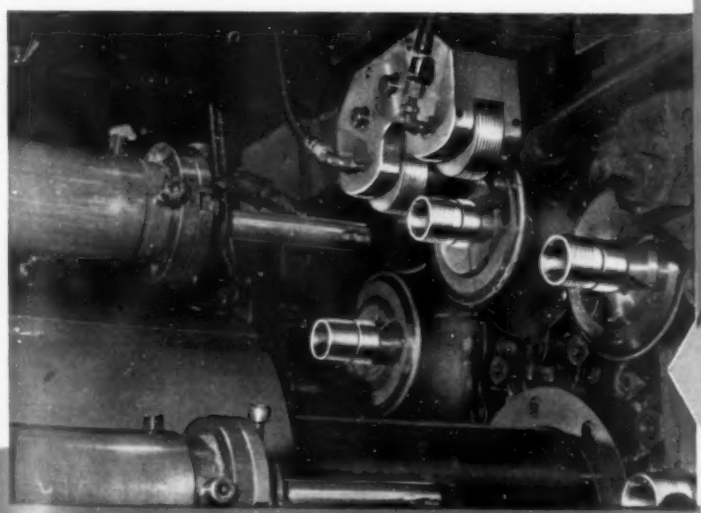
Thread rolls for *any* size and design thread your job requires — including special types made to order — can be supplied. The only limitation on size of attachments which can be supplied is machine capacity and clearance of the slide.



. . . Fay automatic lathes



. . . Bullard Mult-Au-Matics



. . . automatic and hand screw machines

GUARANTEE: Initial installations of SALVO attachments will be made by our factory engineers who will instruct your personnel in re-installing the attachments on other machines in your plant. If, after a 15 day trial run, you are not entirely satisfied with them, you may return the attachments to us at no cost to you.

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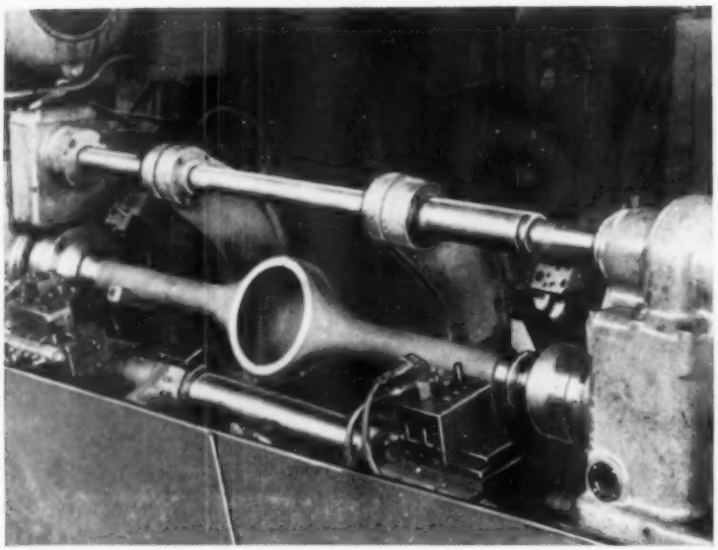
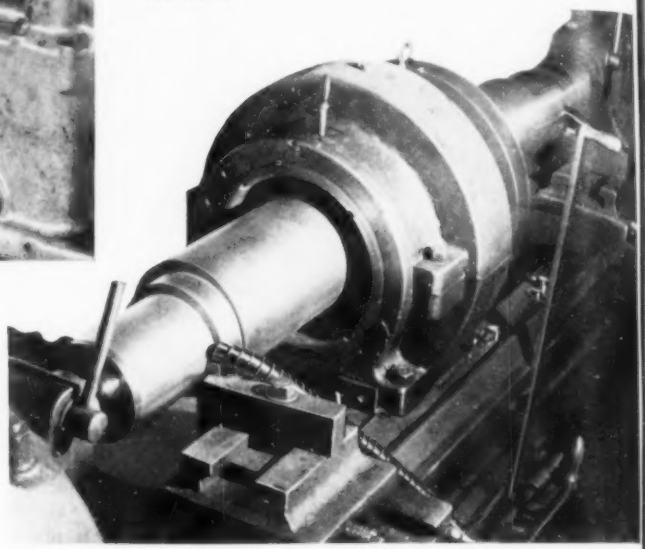
Hard at Red Heat, and Tough, Too



IMPACT RESISTANCE PLUS . . .

HAYNES STELLITE tools are tough! They machine 50 of these axle housings per hour, averaging 15 pieces between grinds. Tool wear and chipping are kept at a minimum despite deep cuts and severe workpiece vibration. HAYNES STELLITE tools handle the cuts at high feed rates, while operating at red heat.



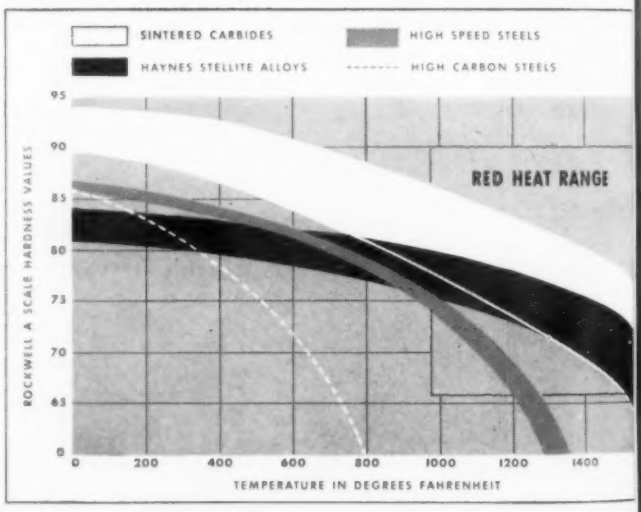
INTERMITTENT CUTTING AT RED HEAT . . .

Machining time on these shafts was cut in half using HAYNES STELLITE tools. The eccentric shafts (SAE 4340 steel) are machined dry, and the tool and chips glow cherry red. The off-center cut, plus the length of the shaft, sets up unavoidable chatter. Harder tools were not tough enough to handle the cut, nor were tougher steel tools effective at red heat. HAYNES STELLITE tools had the combined red hardness and toughness to do the job right.

A COST-CUTTING COMBINATION . . .

This graph shows the hardness properties of HAYNES STELLITE tools. Their high hardness at red heat, combined with their inherent toughness, accounts in part for the fine performance and savings gained through their use.

If your aim is to increase production and cut costs, write today for a copy of "HAYNES STELLITE Metal-Cutting Tools." This manual of tool practice is published as a service to you.



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the revolutionary new coolant system that keeps cutting tools and work at below room temperatures... prolongs tool life, cuts tool breakage loss... saves money...speeds production...keeps work clean...protects operators and is fireproof!

More efficient and adaptable—with separately controlled multiple spray heads. One nozzle can produce a true fog spray while another gives a liquid stream.

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More compact—all controls, regulators, gauges are **in one place,** at the operator's fingertips.

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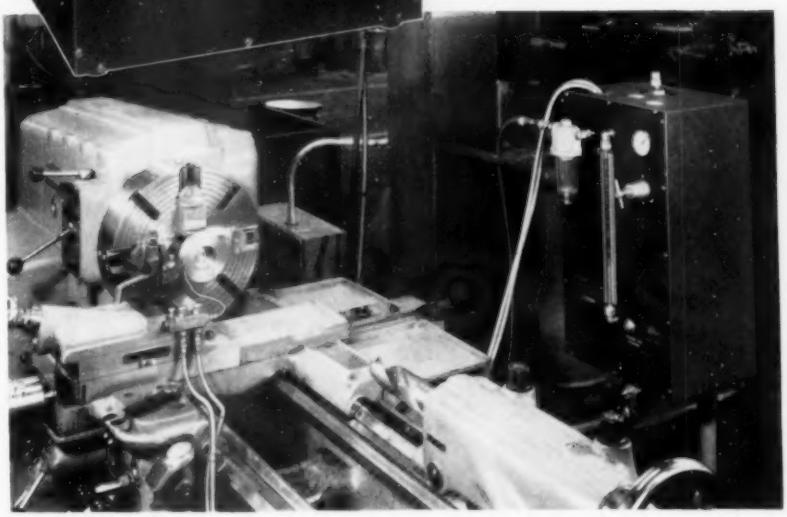

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HIGH SPEED MOTORIZED
VERTICAL HEAD,
POWER DOWN FEED

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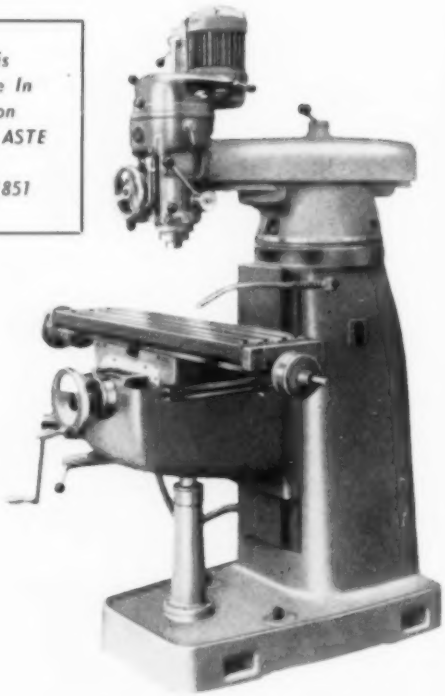

- GEARED POWER DOWN FEED TO SPINDLE
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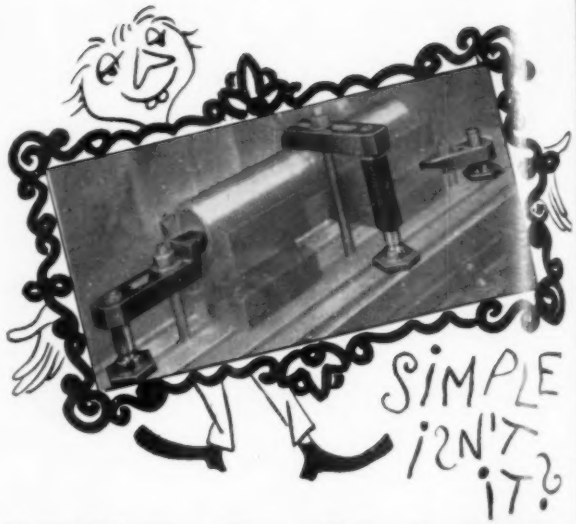

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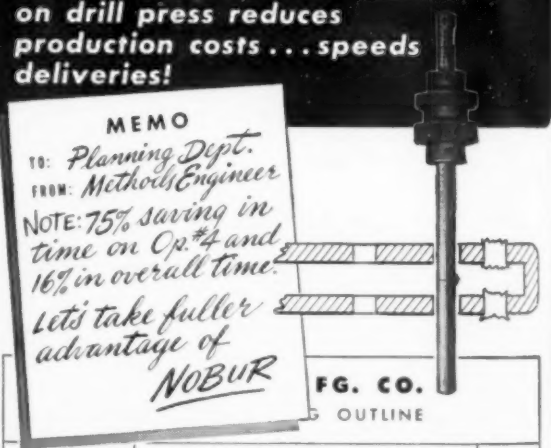
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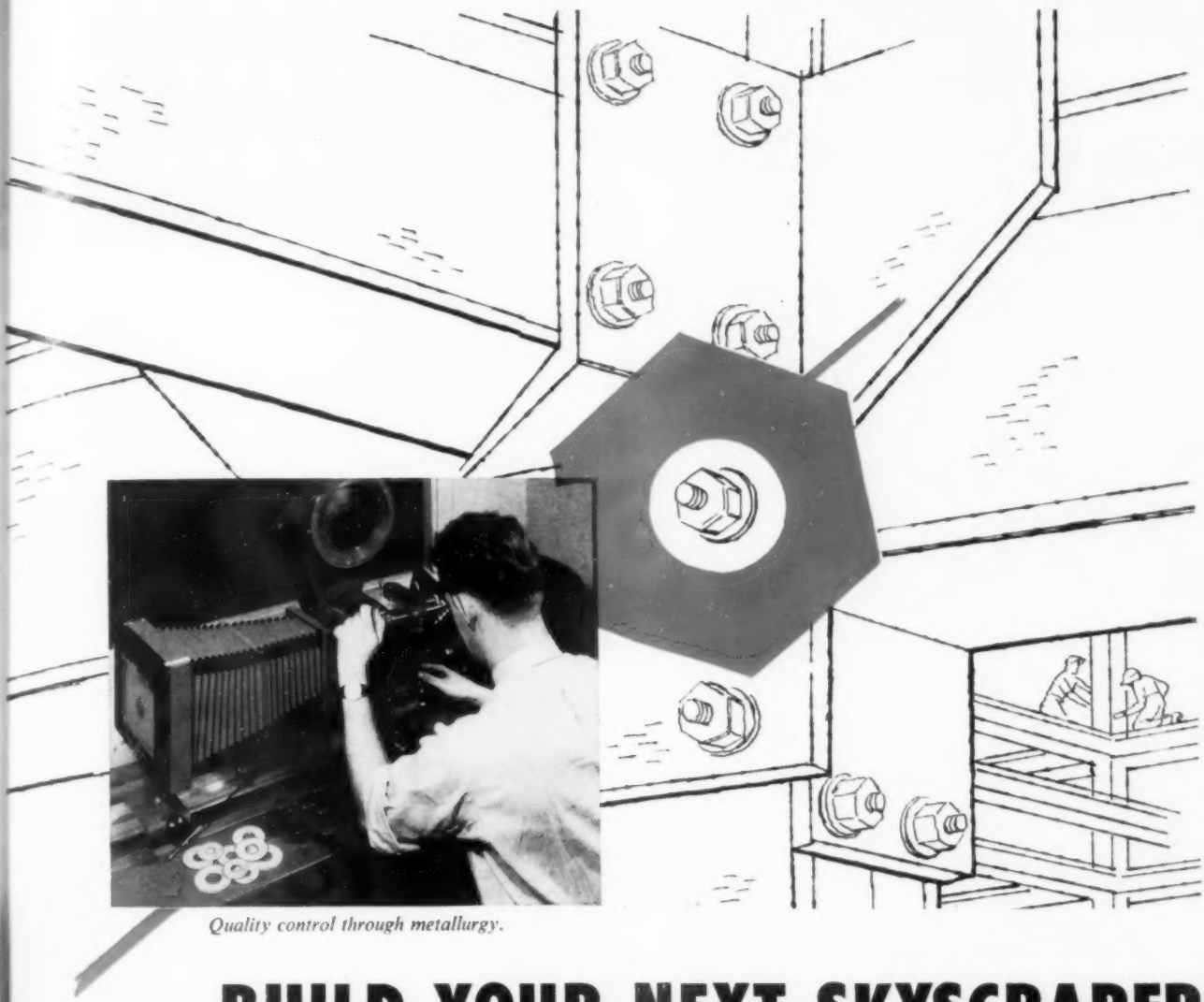

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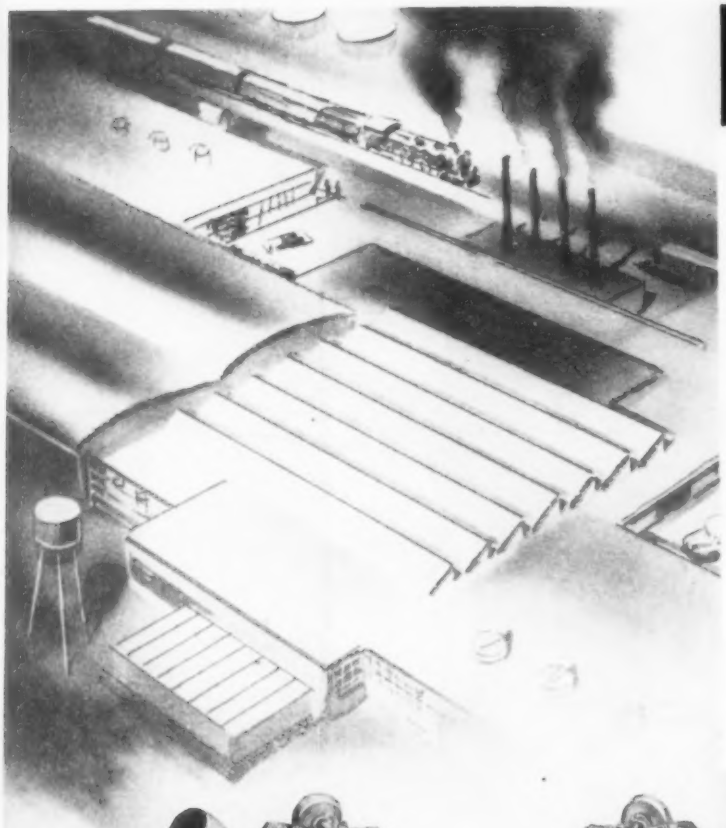

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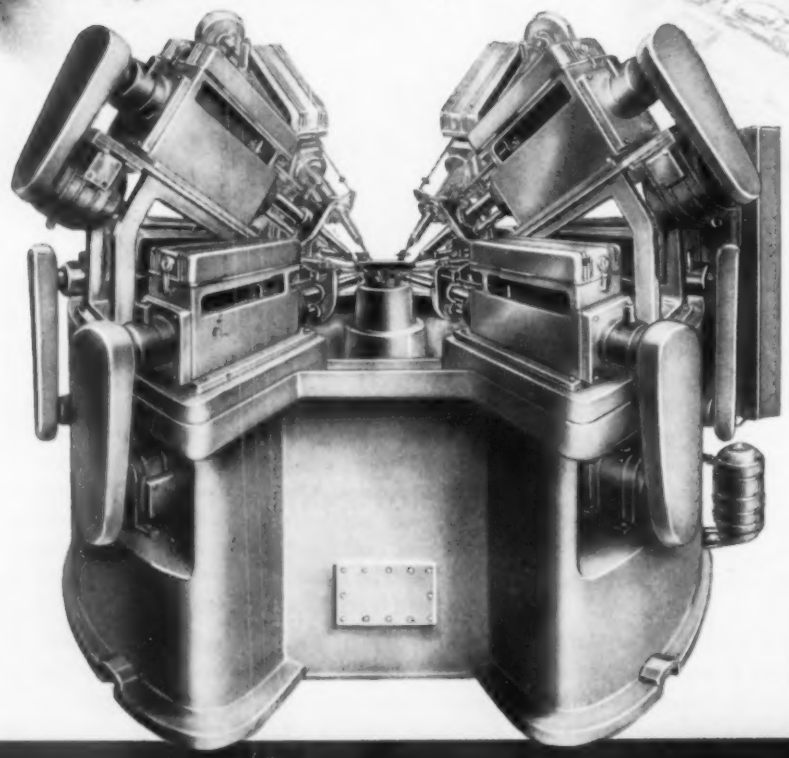

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Or phone or write Drillunit at Detroit for full information and a demonstration-appointment.

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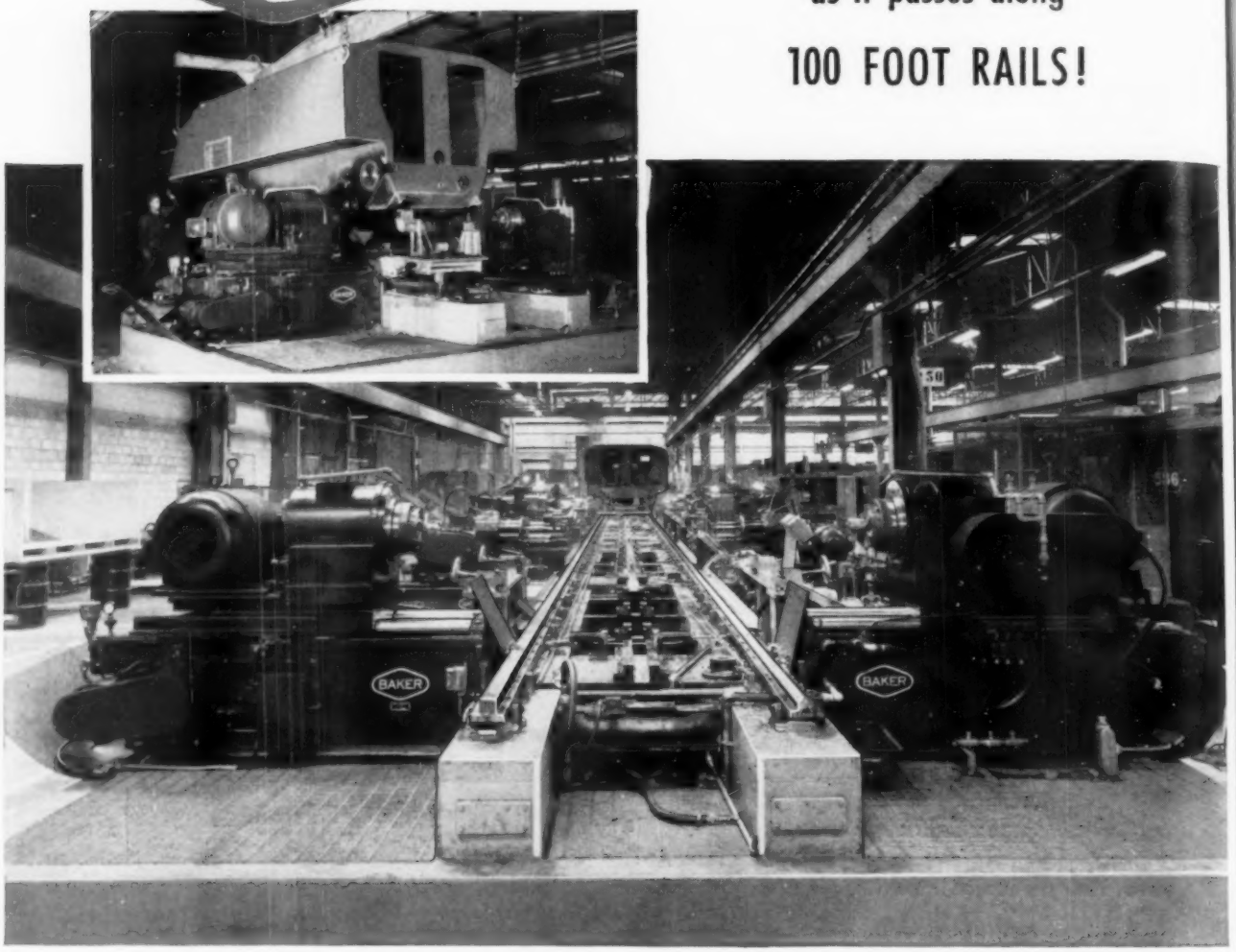

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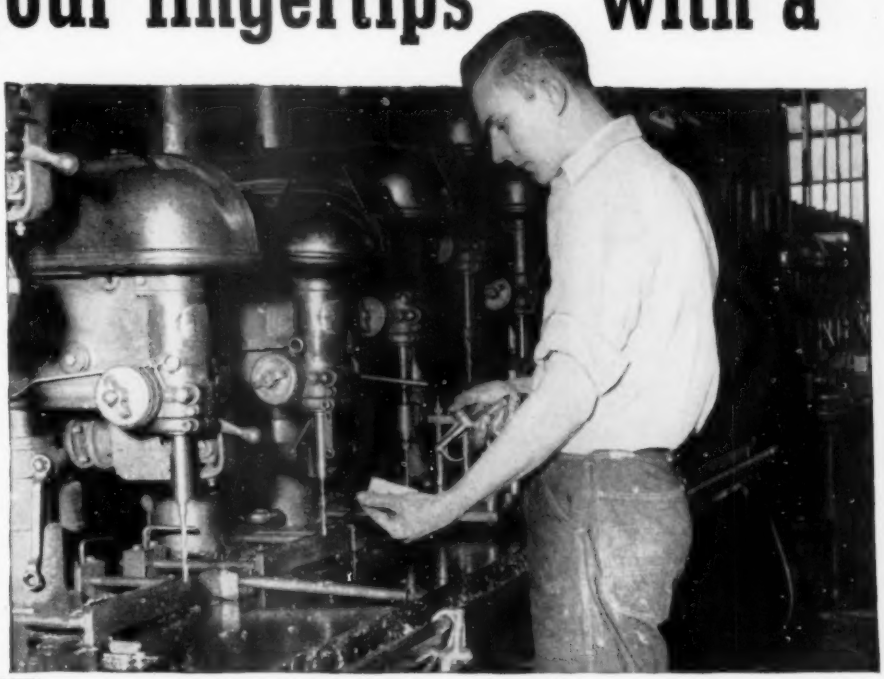

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Choose the Blow Gun that suits you best from the thirty-six designs and styles of Schrader Blow Guns available. The interchangeable adjustable and non-adjustable noses also available make Schrader Blow Guns the most versatile you can buy.

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And this is only one of many designs and styles of Schrader Blow Guns available to you. At the left, you'll see typical examples of the several blow guns with interchangeable noses that will give you *exactly the blow gun you need.* Get full information by return mail!

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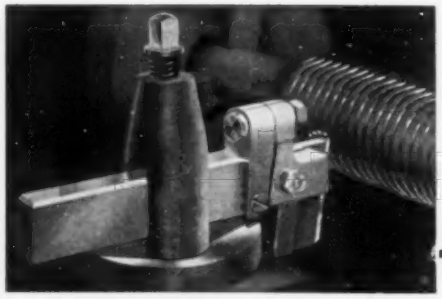

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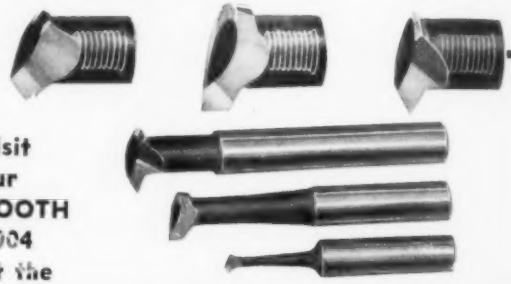

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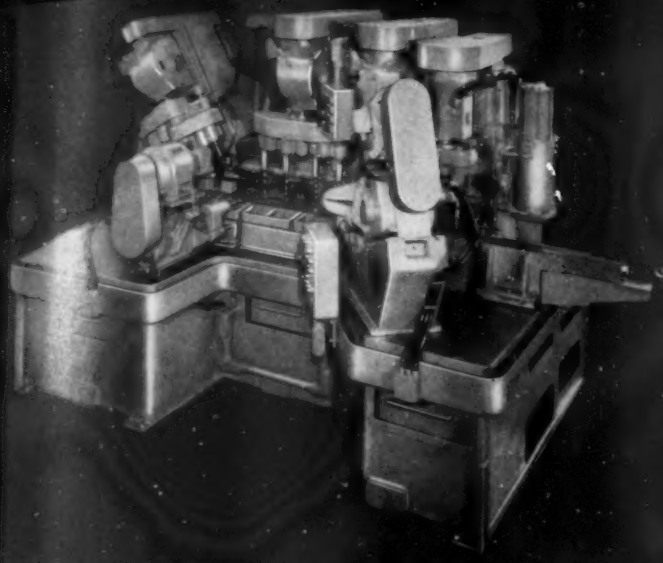

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- **HEAVY CONSTRUCTION** . . . Bed, Wheel Head and Spindle and Column are all built for added stability, heavy duty production and long life with minimum maintenance.
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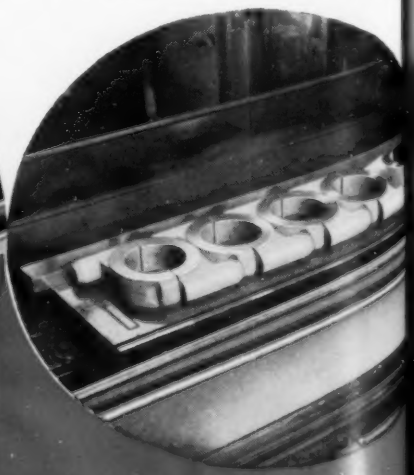

Cast Iron, 4½" ID, 5¼" OD, 9 pieces per ½" stock removed per side. Grinding [illegible] 5.6 minutes.

MODERNIZE with the NEW

PRATT & WHITNEY

MODEL "D"

HYDRAULIC VERTICAL

SURFACE GRINDER

WHEEL DIAMETER

14" Ring Wheel or

17" Segmental Wheel

TABLE WORKING SURFACE

12" x 36" or
12" x 60"

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See how the new Model "D" can help **you** beat rising production costs. Write on your company letterhead for your free copy of Circular No. 569.

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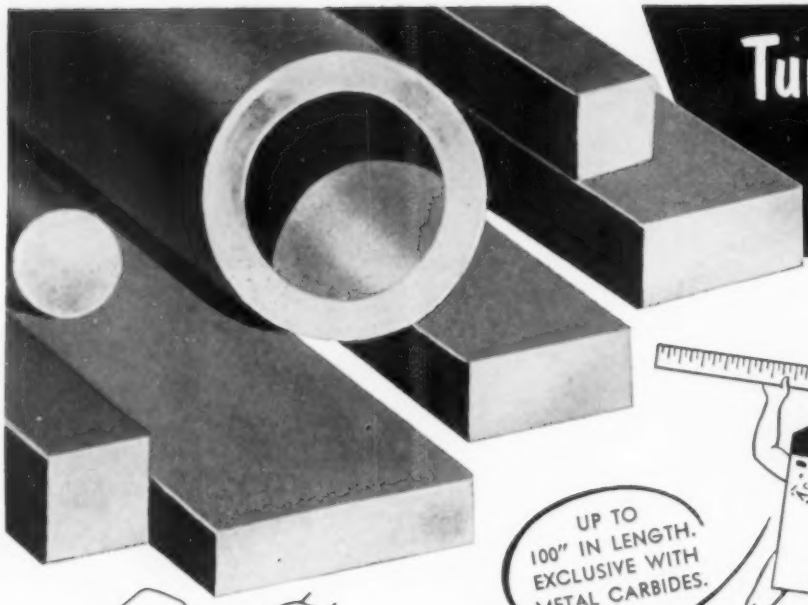
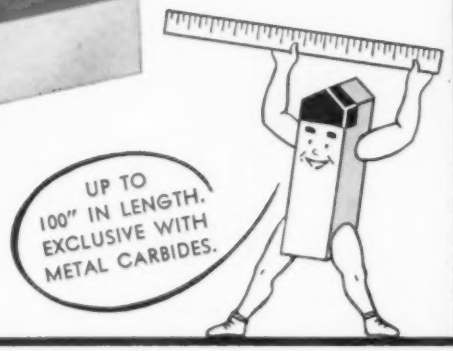
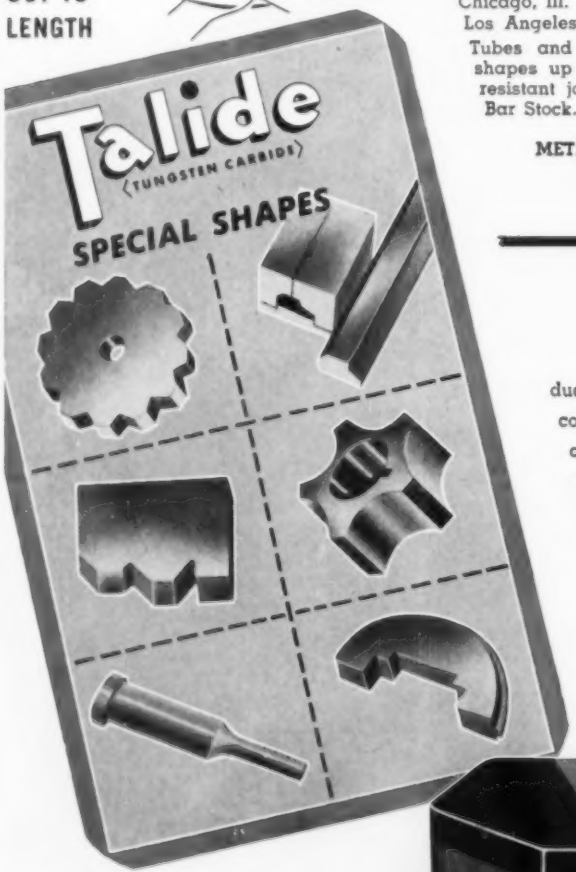
Tungsten Carbide Bar Stock





FIRST TO OFFER BAR STOCK CUT TO LENGTH



● Talide Bar Stock cut to any length is available now from these warehouses:

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Detroit, Mich. ..... 20485 Van Dyke
Youngstown, Ohio ..... 107 E. Indianola Ave.
Chicago, Ill. ..... 601 N. Milwaukee Ave.
Los Angeles, Calif. ..... 7799 Telegraph Road

Tubes and rods; and square and rectangular shapes up to ¾" are in stock. On any wear-resistant job, you save money by using Talide Bar Stock.

METAL CARBIDES CORPORATION
YOUNGSTOWN 7, OHIO

● Large Grinding Wheel Maker using Talide Bar Stock as core pins for forming bore of refractory wheels during pressing operation reports greater accuracy and concentricity maintained—with service life increased from 3 days to 90 days.

● A leading Electrical Equipment Manufacturer blanking .014" silicon steel sheets for transformers has reduced costs 40% by tipping cutting edges of shear blades with Talide Bar Stock. Cleaner cutting action obtained with edge burr eliminated.

● Leading Eastern Carbon Producer reports they save 30% on tooling costs finishing their own dies, punches and core pins from Talide Bar Stock. In addition, service life is increased 70 to 1 over steel die assemblies previously used.

● A Midwest Machine Tool Company has substituted grinding spindle sleeve bearings made from Talide Bar Stock with result that vibration and whip have been reduced, closer tolerance achieved, and improved finish obtained on parts ground.

Send for new 84-page Catalog 54-G or ask for sales engineer to call.

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OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

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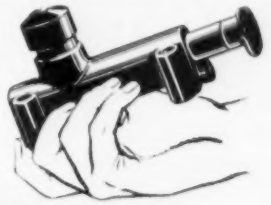
Get What You Want

With the recent addition of such new items as this heavy-duty jack with working parts of hardened-tool steel, Lodding now offers the most complete line of standard jigs and fixtures available.



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AT THE **ASTE EXHIBITION**

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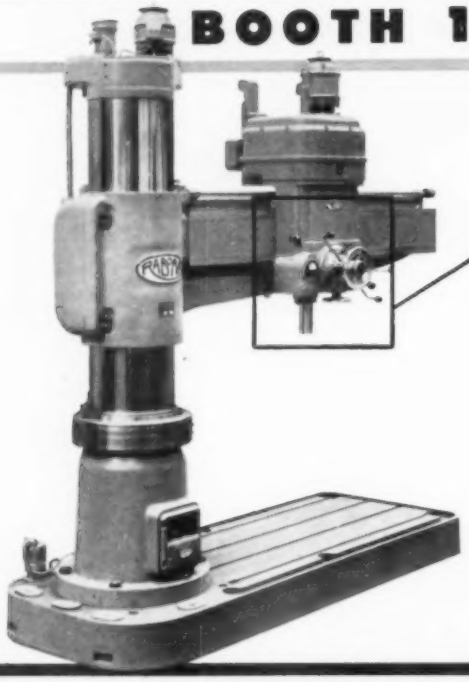

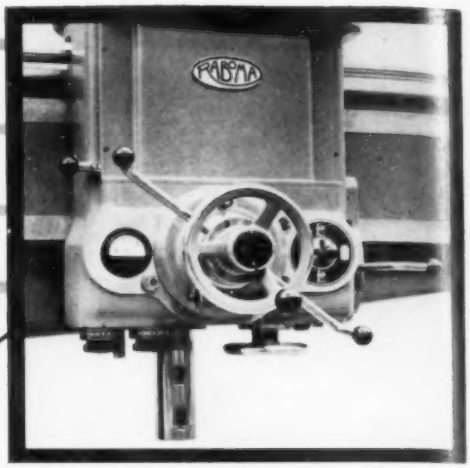

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Speed & Feed Preselectors

Many sizes from 3' arm—12" column
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Always **SAVES SET-UP TIME**

Types to fit any machine used for tapping or reaming.

On tapping and reaming jobs, you'll find that the Ziegler Tool Holder will enable you to make set-ups much faster than with ordinary tool holders.

This is because, with the Ziegler, set-ups do not have to be so painstakingly made. It is sufficient if the work is aligned with the spindle to within 1/32" on the radius or 1/16" on the diameter. The Ziegler Holder automatically compensates for the difference.

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hole location, easy
contour inspection
with *new* machine
tool microscope

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Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

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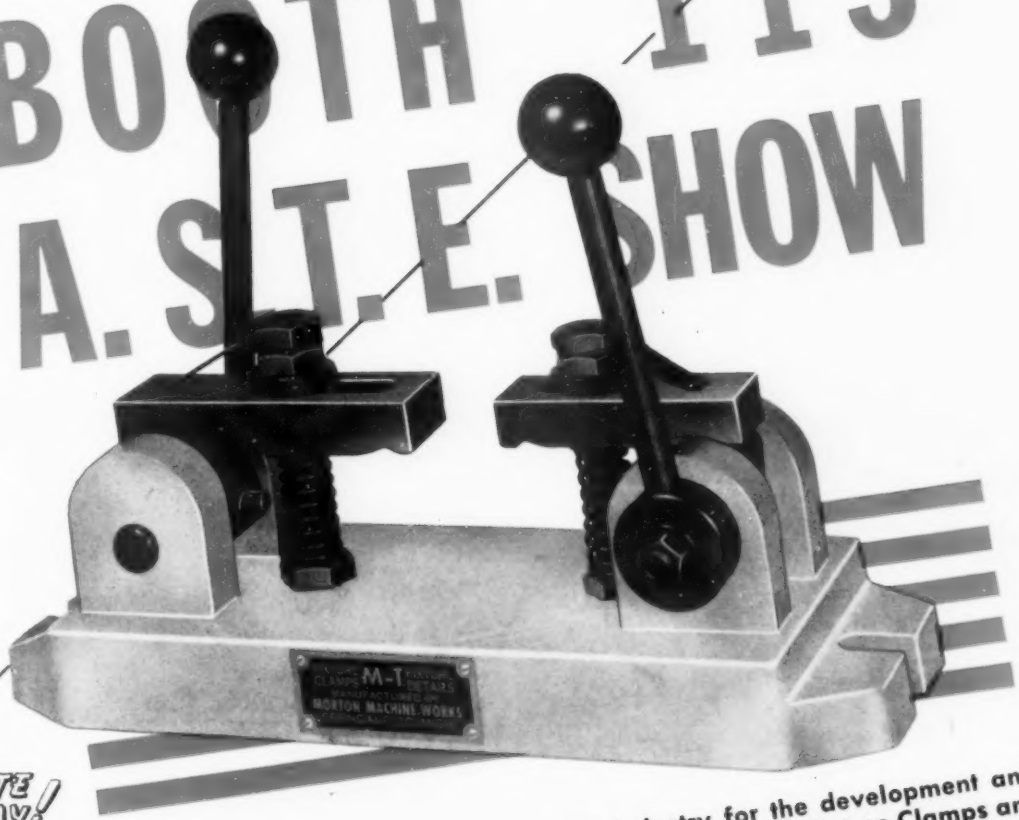
MEET MORTON BOOTH 113 A.S.T.E. SHOW



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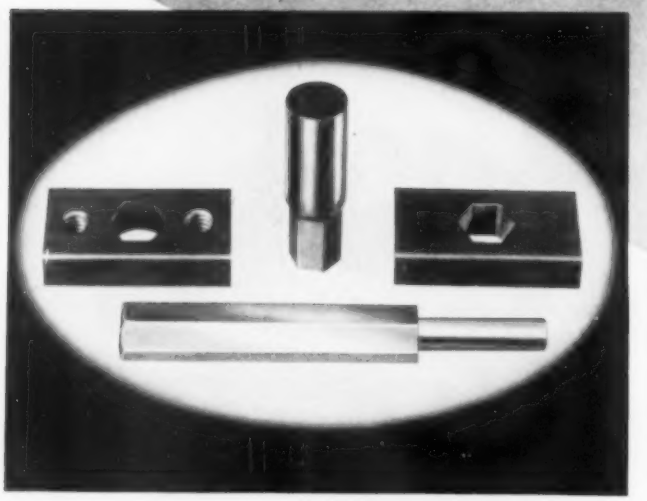
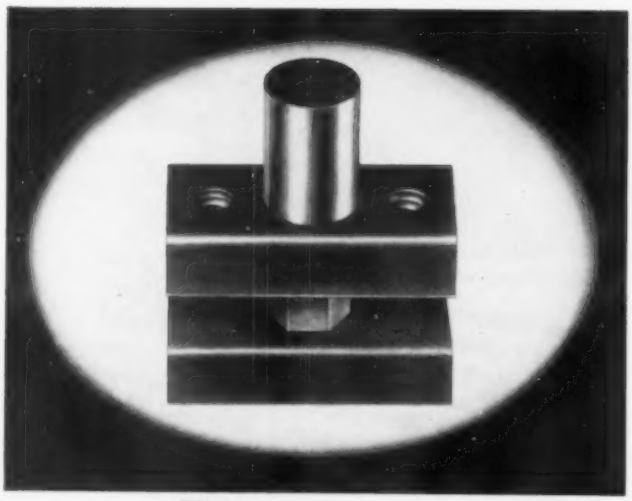
Can You Make This Punch, Die and Stripper Plate Out of Tungsten Carbide for





$35.50*

In Your Plant

Electrode manufacturing time	2 hours
Cutting time on die	½ hour
Cutting time on stripper	½ hour
Cutting time on punch	½ hour
Accumulated setup time	1 hour
TOTAL LABOR TIME:	4½ Hours
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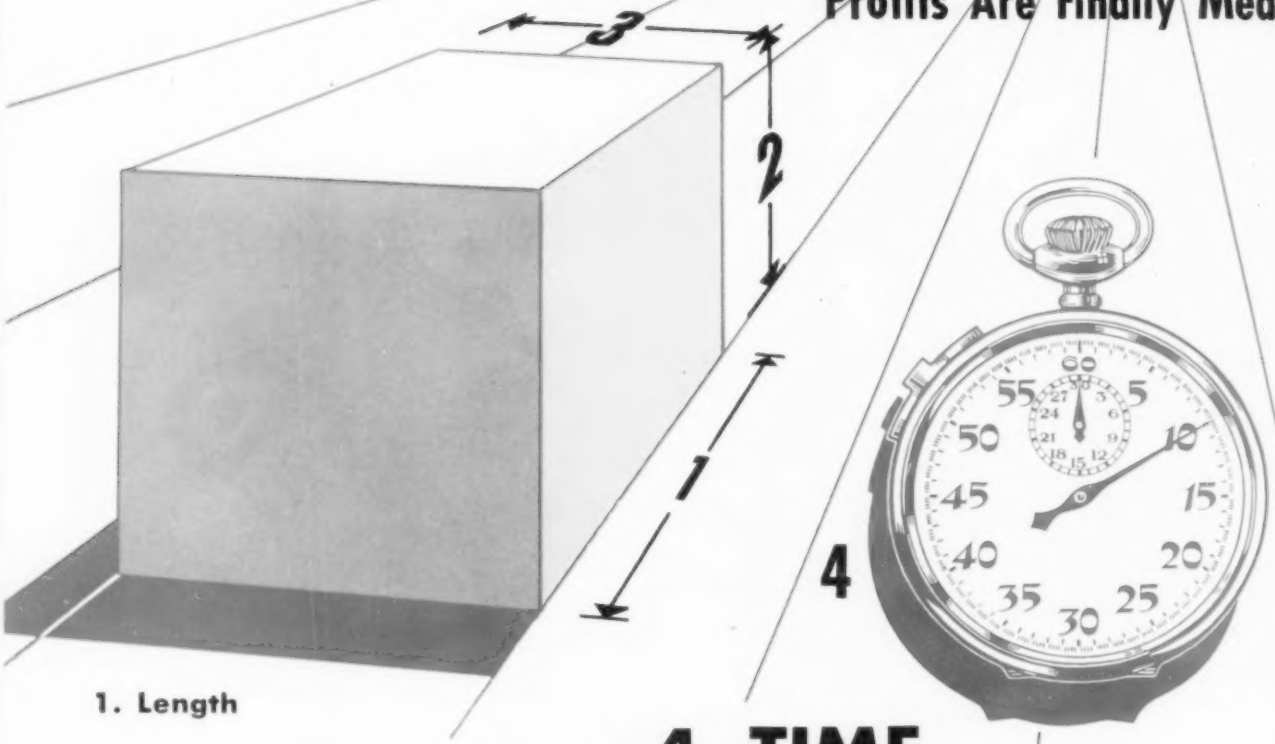
Lifts Production to the Level of 4TH DIMENSION Where All Industrial Results and Profits Are Finally Measured!



1. Length

2. Height **3. Width** **and** **4. TIME**

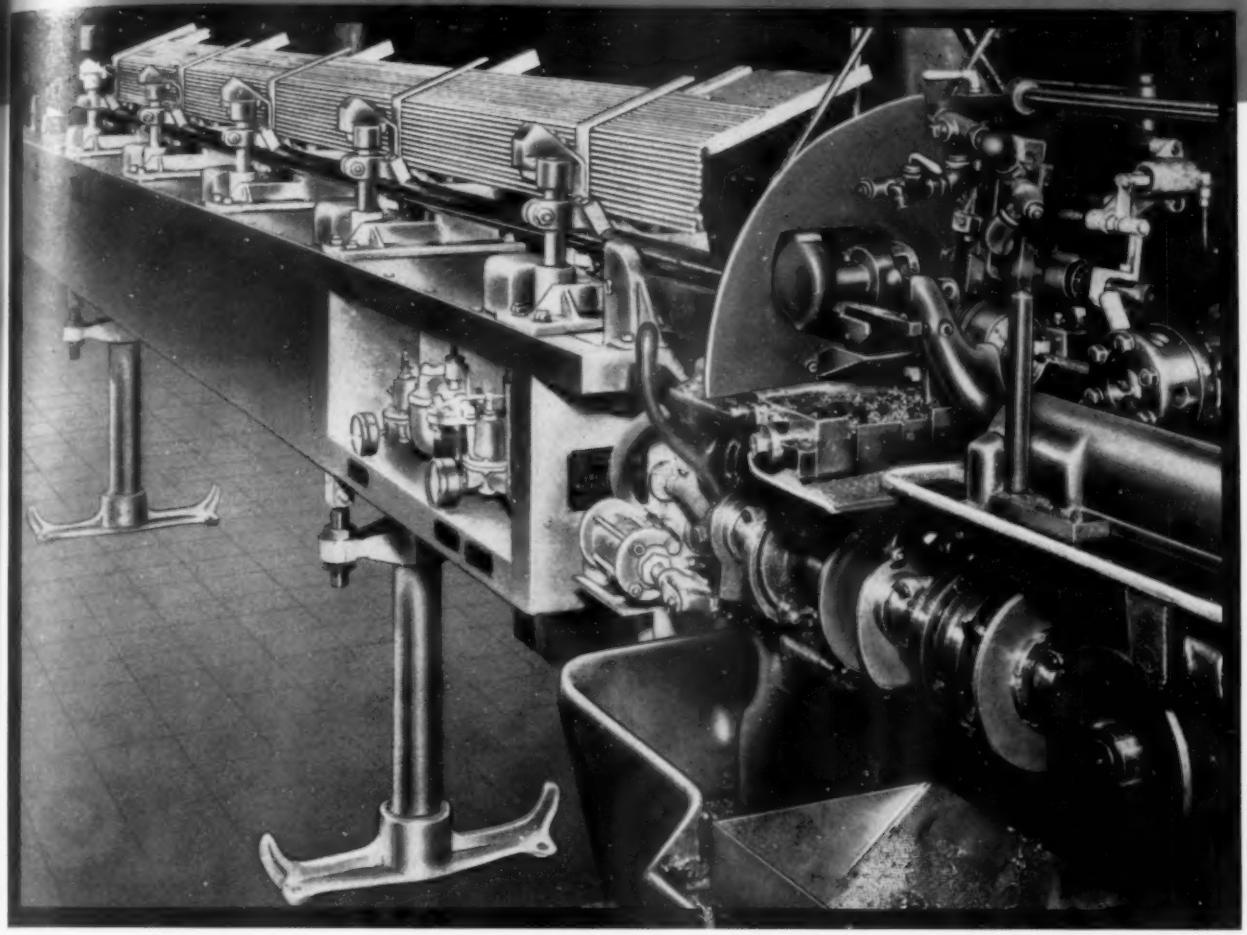
You're careful about 3-dimensional accuracy, of course. Precision to four decimal places in screw-machine output is commonplace. *But how about TIME, the important fourth dimension?* Measurement that determines all industrial results, costs, profits.

Production is a succession of motions, cycles, piece-to-piece operations. But it's the overall result in world time, the plant output of finished pieces per hour, day and week which add up to the *absolute reality* of success or failure, profit or loss.

In this modern Lipe Automatic Magazine-Loading Bar Feed, we present an automatic feed that derives from every man and every machine a smooth flow of operations, a steady-state succession of events in world time which mathematicians, scientists and philosophers know as the *Fourth Dimension.*

Actual production increases per man hour and machine dollar may seem large in contrast to your present output. But remember the Lipe AML Bar Feed gears a succession of normally non-uniform cycles to the steadily moving stream of TIME . . . *the dynamic 4th DIMENSION of both the production line and the universe.*

It BREAKS THE TIME BARRIER!



Lipe AML BAR FEED

Exploits the 4TH DIMENSION to Achieve At Least 30% Increase in Production!...

- **FEEDS STOCK *CONTINUOUSLY*—** *No Time Lost* Cutting Air
- ***ELIMINATES* FEED FINGERS—** *No Time Lost* in Adjustments or Replacements
- **EJECTS REMNANTS *AUTOMATICALLY*—** *No Time Lost* in Remnant Disposal
- **PERMITS *QUICK* SET-UPS—** *No Time Lost* with Tricky Controls On Short or Long Runs
- **SEE IT AT THE SHOW**—See the remarkable Lipe AML Bar Feed in action at the ASTE Show, Philadelphia, Pa., Booth #726. Or write for descriptive literature and list of well-known users.

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Manufacturers of Automotive Clutches and Machine Tools

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You Need Precision Flatness, Finish and Parallelity Like This... in Production Quantities

GAS METER PART (Bakelite) Surface Flatness .000058". Finish 20 R.M.S.
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LAMINATED TRANSFORMER CORE (Soft Steel) Surface Flatness .000046". (95% contact.)
VALVE BODY (Cast Aluminum) Mating Surface Flatness .000046".

Investigate the Lapmaster

Precision flatness and finish as shown in the drawings can be obtained easily with the Lapmaster and, *at high production rates*. In addition manufacturers of pumps, compressors, valves and other equipment containing liquids or gases under pressure are now using production lapping to great advantage—have eliminated gaskets in mating surfaces, have improved product performance.

To determine whether lapping can be practical and profitable for you, we maintain a laboratory for lapping sample parts. If you believe it offers possibilities we invite you to send prints of the parts, together with surface finish requirements and production desired. In addition send several parts for test lapping. We can then give you the facts on what you can expect from the Lapmaster. There is no obligation for this service.

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact filled booklets will be sent to you upon request. Write today.

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CRANE PACKING COMPANY

Range: 36 inches O.D. blank down to a fraction of an inch. Maximum capacity between centers: 80 inches. Special machines have been built to handle diameters up to 6 feet. Shown above is External Geargrind Machine, model GG10X48A.

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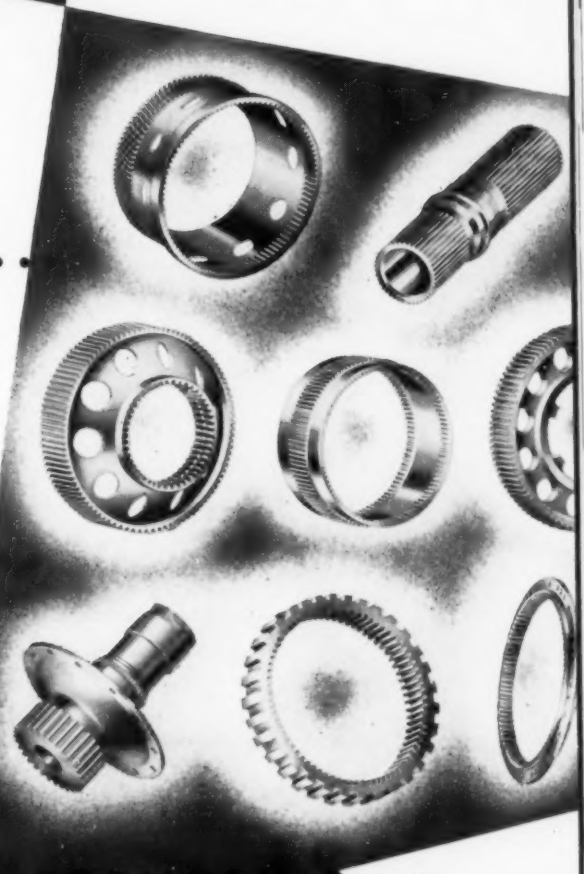
for Formgrinding Parts Like These . .



Actual operating experience shows: these automatic Geargrind Machines will equal or exceed the continuous production rate of other similar-purpose machines. And, they will do a greater variety of work: aircraft, automotive, machinery, etc.

Gears, splines, and specially contoured parts of all kinds are turned out quickly, accurately on versatile Geargrind Machines.

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*For bar or expanding arbor work

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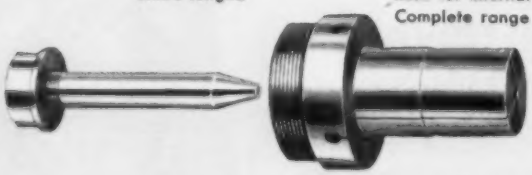
Likewise, the Levermatic can be used effectively as a non-rotating work-holding device on milling machines, gear hobbers, grinders and many types of special machinery. Available in three sizes —1″, 1½″ and 2″ capacities.

Co-netic Collet →
Separate sections allow full floating, self-aligning action in each jaw. Applies uniform pressure over entire length.

Expanding Arbor
Mounts quickly, directly to spindle nose for internal gripping. Complete range of sizes available.



RUNS AS TRUE AS THE SPINDLE

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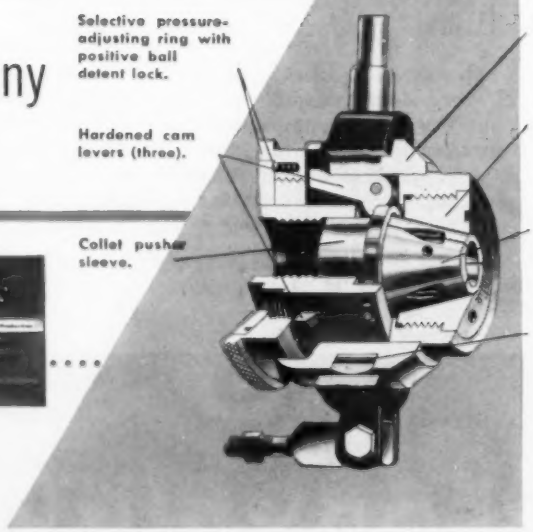
Selective pressure-adjusting ring with positive ball detent lock.
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Positive cam closing collar.
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The new Co-netic Collet—new parallel grip design.
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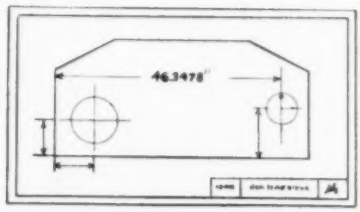

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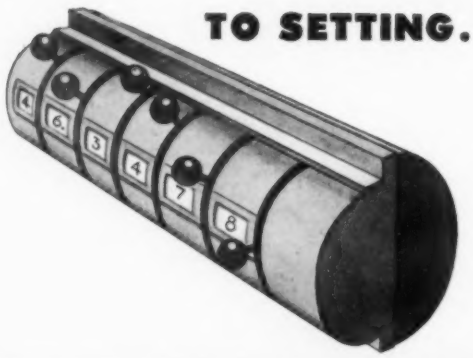

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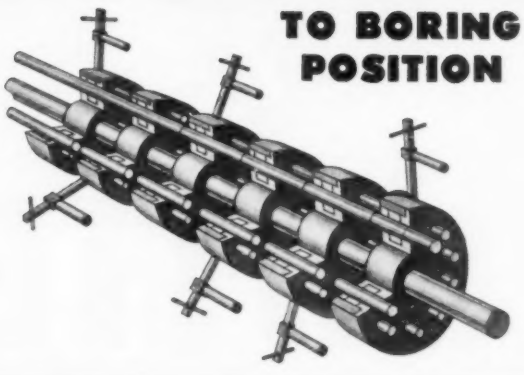
ELIMINATES JIGS & FIXTURES!

No need to set graduated dials, lead screws, end rods or special gage bars.



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See this machine in operation at the

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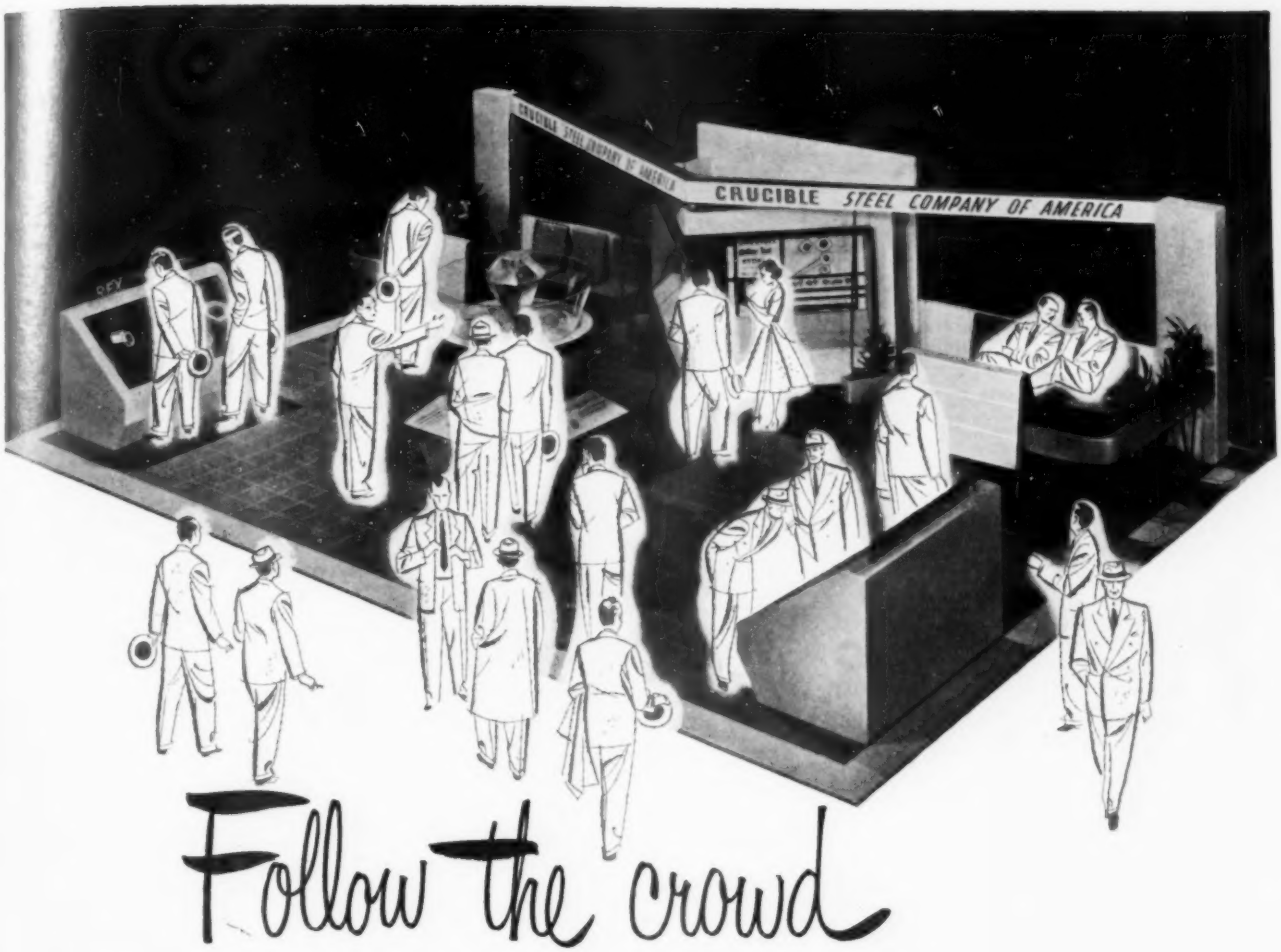

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American Society of Tool Engineers Show
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April 26-30

There are always worth-while things to see at the Crucible exhibit... and there'll be even more in the way of helpful material this year. Among other items, you'll find new exhibits and information on Rex high speed steels, tool steels — including hollow tool steel bars — and other special purpose steels.

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54 years of Fine steelmaking **TOOL STEELS**

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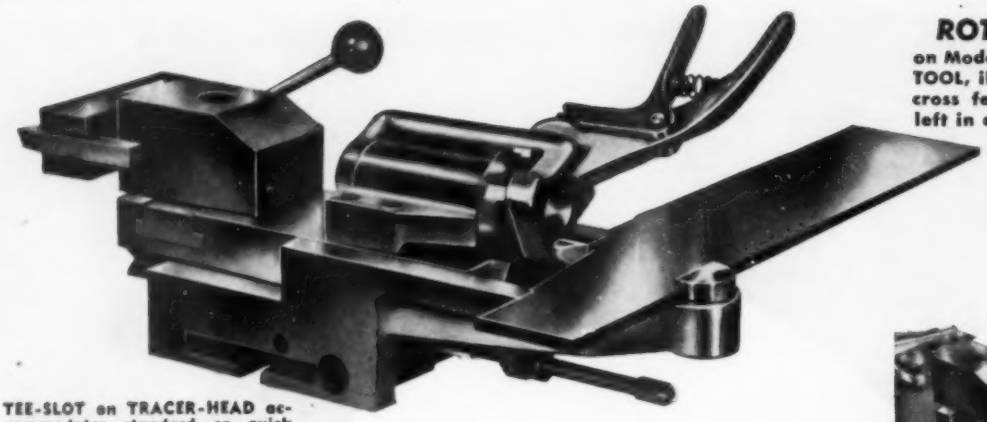
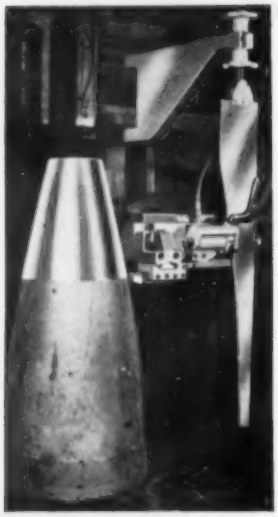
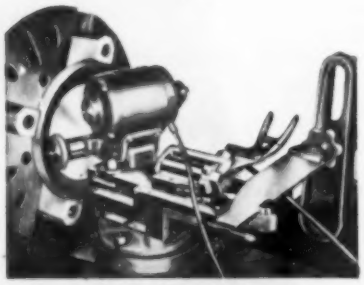


ROTARY STYLUS— on Model M-1500 Lehigh TRACER-TOOL, illustrated at left, permits cross feed screw to be set and left in one position while successive pieces are machined or cuts are made. Speeds production. Assures accuracy even on old worn lathes.

TEE-SLOT on TRACER-HEAD accommodates standard or quick change tool holders, square turrets, planer clapper box, grinding attachments, boring bars, etc.



BULLARD OPERATIONS
— including outside and inside tracing. Tracer-head adapts to ram.



CONTOUR GRINDING
— including internal and external contours.

Faster—lower cost
LATHE DUPLICATING
WITH ***ANY*** ENGINE OR TURRET LATHE

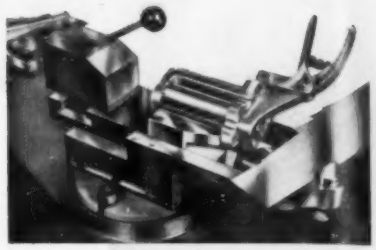
- No complicated electronic or hydraulic controls.
- Quickly set up without making permanent alterations to the lathe. Does not tie up costly capital equipment.
- Gives complete working visibility and chip clearance.
- Positive stylus contact assured by air pressure to tool through a 3-way valve and pressure regulator. Uses shop pressure.
- Horizontal slide on Tracer Head operates between pre-loaded ball bearings. Precision built.
- Uses easily made, low cost, hardened templates.
- Proved in hundreds of shops of all sizes and in scores of major manufacturing and service industries for short and production runs.

MODELS NOW AVAILABLE

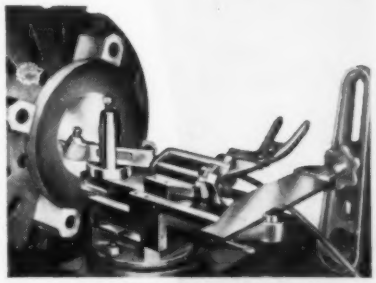
EL-1100 *to fit lathes 9"-14"*.....*Price* **$375**
M-1500 *to fit lathes 16"-24"*.....*Price* **$725**
EL-2000 *to fit lathes 24" & larger*.....*Price* **$975**

Prices subject to change without notice • Tool holder and template not included • Air valve and regulator supplied only with Models M-1500 and EL-2000.

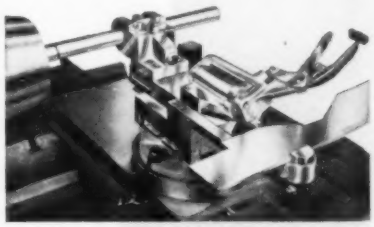
ENGINEERING SERVICE
Our engineering department will be glad to advise you on any duplicating problem. Catalog and engineering bulletins on request.



O.D. CONTOUR TURNING
— and tapering. Unlimited radii.



CONTOUR FACING
— or any engine or turret lathe.



I.D. BORING
— consisting of various blended radii as well as 90° steps.

See Lehigh TRACER-TOOL **DEMONSTRATED** at the **ASTE INDUSTRIAL EXPOSITION Booth No. 1355**

AIR CONTROL DIVISION OF

Lehigh Foundries, Inc.

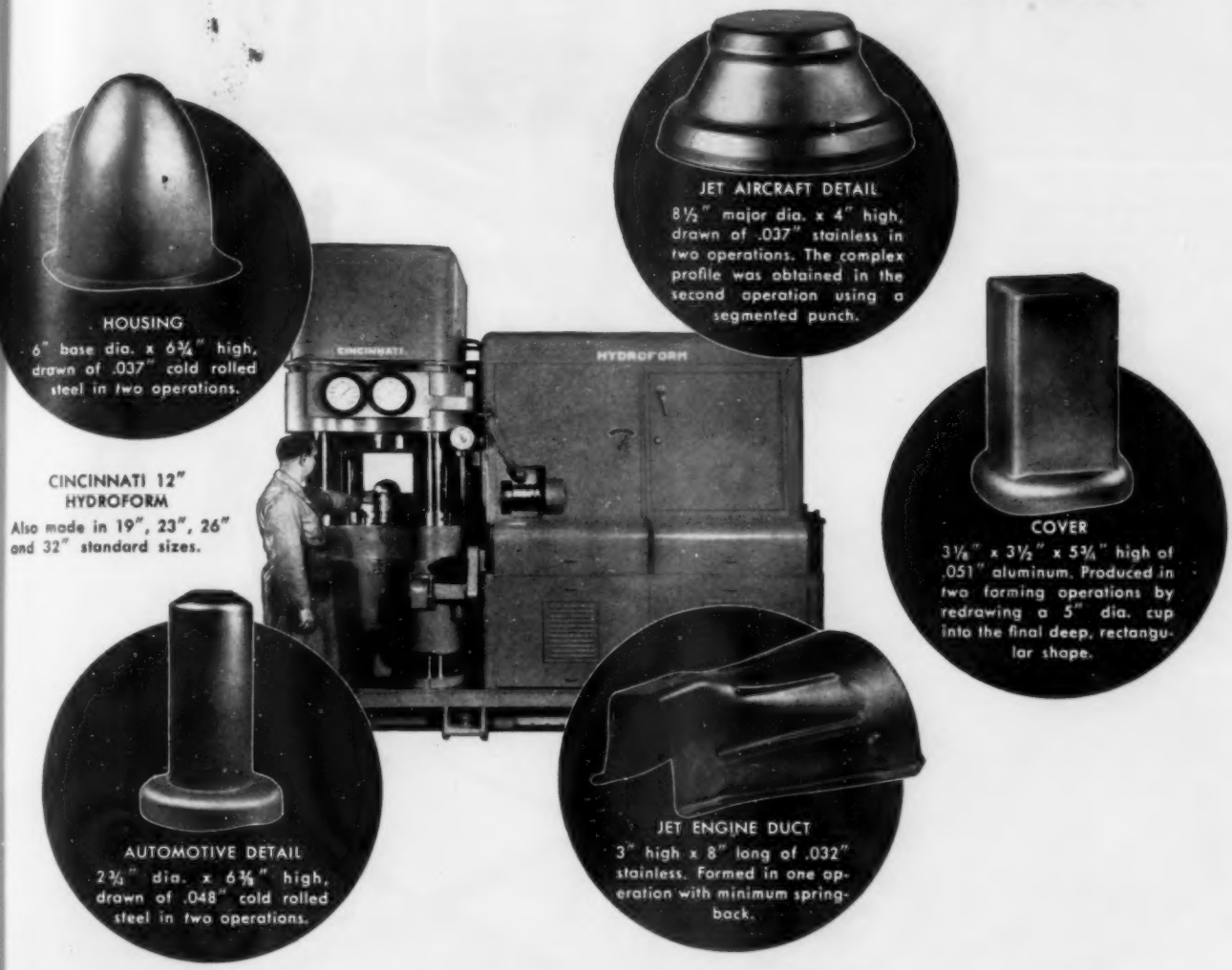
1508 LEHIGH DRIVE, EASTON, PA.

Lehigh
TRACER-TOOL®
PROFILE-TRACING LATHE ATTACHMENT

West Coast Distributor: CAMPBELL CONTOUR ATTACHMENT COMPANY, 1320 W. Esther St., Long Beach, Calif.

MFGRS. OF AIR VALVES • AIR CYLINDERS • AIR HOISTS • AIR MOTORS • PRECISION CASTINGS • AUTOMATIC VENDING MACHINES • COMMERCIAL REFRIGERATION SYSTEMS & UNITS

When the draw is <u>difficult</u>... or the tool cost per unit is <u>excessive</u>...


HOUSING
6" base dia. x 6¾" high, drawn of .037" cold rolled steel in two operations.
JET AIRCRAFT DETAIL
8½" major dia. x 4" high, drawn of .037" stainless in two operations. The complex profile was obtained in the second operation using a segmented punch.
CINCINNATI 12" HYDROFORM
Also made in 19", 23", 26" and 32" standard sizes.
COVER
3⅛" x 3½" x 5¾" high of .051" aluminum. Produced in two forming operations by redrawing a 5" dia. cup into the final deep, rectangular shape.
AUTOMOTIVE DETAIL
2¾" dia. x 6⅜" high, drawn of .048" cold rolled steel in two operations.
JET ENGINE DUCT
3" high x 8" long of .032" stainless. Formed in one operation with minimum springback.

then use Hydroforming

Each of the parts shown above represents a difficult drawing job made *easy* by *Hydroforming*. No more than *two forming operations* were required to produce any one part.

The combination of the Hydroform's ability to draw intricate or difficult shapes in fewer operations than conventional methods permit . . . plus the use of simple tooling that cuts toolmaking time to a day or two, instead of requiring weeks or months . . . made possible *quick* deliveries of these parts at *reasonable* unit costs.

Can you utilize these Hydroforming advantages to make your manufacturing methods more efficient—more economical? Call in a Cincinnati Milling field engineer. Let him give you complete information. Bulletin M-1759-2 supplies data on the Hydroforming process as well as machine specifications. Write for your copy.

CINCINNATI Hydroform

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

Here's the WAY to do it.

Model 3040 Kaukauna Horizontal Drilling and Tapping Machine. 73"x7" railslide ways are Ampco Grade 8 Metal.

Kaukauna Machine Corp.

Kaukauna, Wisconsin

Product: Kaukauna Horizontal Drilling and Tapping Machine Model 3040.

Problem: To find a railslide way material that would provide dependable life in a tough service application. It had to resist high bearing pressures and maintain the close tolerances required in machine tool service. Wear was a problem — the slide travels at speeds up to 100 inches per minute. The material also had to provide superior bearing qualities to operate satisfactorily against the semi-steel bed casting.

Solution: **AMPCO METAL**

Results: The Ampco Metal ways show practically no wear in this tough, continuous service. That's how Ampco Metal helps Kaukauna guard its reputation for dependable operation and top-grade output.

And that's why you find Ampco Metal at critical points in all types of machine tools — wherever wear and high bearing pressures are factors.

IT'S PRODUCTION-WISE TO AMPCO-IZE!

See us at the Tool Show
Booth 1730

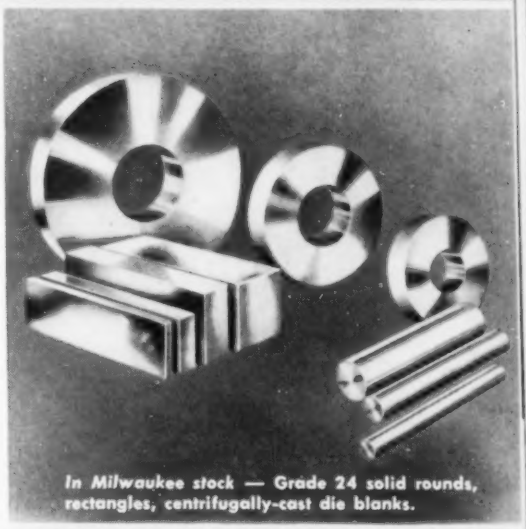
Philadelphia
Convention Center
April 26-30

Sand-cast water wheel — 12,000 lbs.

Extruded solids, hollow rounds, and shapes.

Kaukauna Machine Corporation fights wear and high bearing pressures with

AMPCO* METAL



In Milwaukee stock — Grade 24 solid rounds, rectangles, centrifugally-cast die blanks.

THE ability to stand up year after year in tough machine-tool service proves that Ampco Metal can really take it.

And Ampco Metal — a series of special alloys — adds longer life to both your product and production equipment, gives you lower costs, less grief. Here's why:

Ampco Metal has high compressive strength — won't squash out. It has remarkable resistance to wear in all its forms — abrasion, corrosion, erosion, cavitation-pitting, etc. Ampco Metal gives you high impact and fatigue values — makes a superior bearing material. That's why it is often called "the Metal without an Equal."

Ampco Metal is easy to use — available in practically any form you need. You can get it in sand and centrifugal castings, sheet, plate, fittings, and fasteners. Also available as forgings, tubes, bars, extruded shapes, and welding electrodes and wire.

Perhaps Ampco Metal is the answer to wear, shock, load, and many other troublesome problems you face. Let it help you to build greater customer satisfaction into your product, or to obtain higher production, lower costs, longer runs in your plant. Get complete information on any application from your nearby Ampco field engineer or write us.

*Reg. U. S. Pat. Off.

Clutch ring — Centrifugally-cast.

Tear out this coupon and mail today!

Ampco Metal, Inc.

MILWAUKEE 46, WISCONSIN

WEST COAST PLANT, BURBANK, CALIFORNIA

LET AMPCO PROVE ITS ~~METAL~~ *mettle*

AMPCO METAL, INC., Dept. TE-4, Milwaukee 46, Wisconsin

I'd like to know more about Ampco Metal. Kindly send me your descriptive literature without obligation.

Name..... Title.....

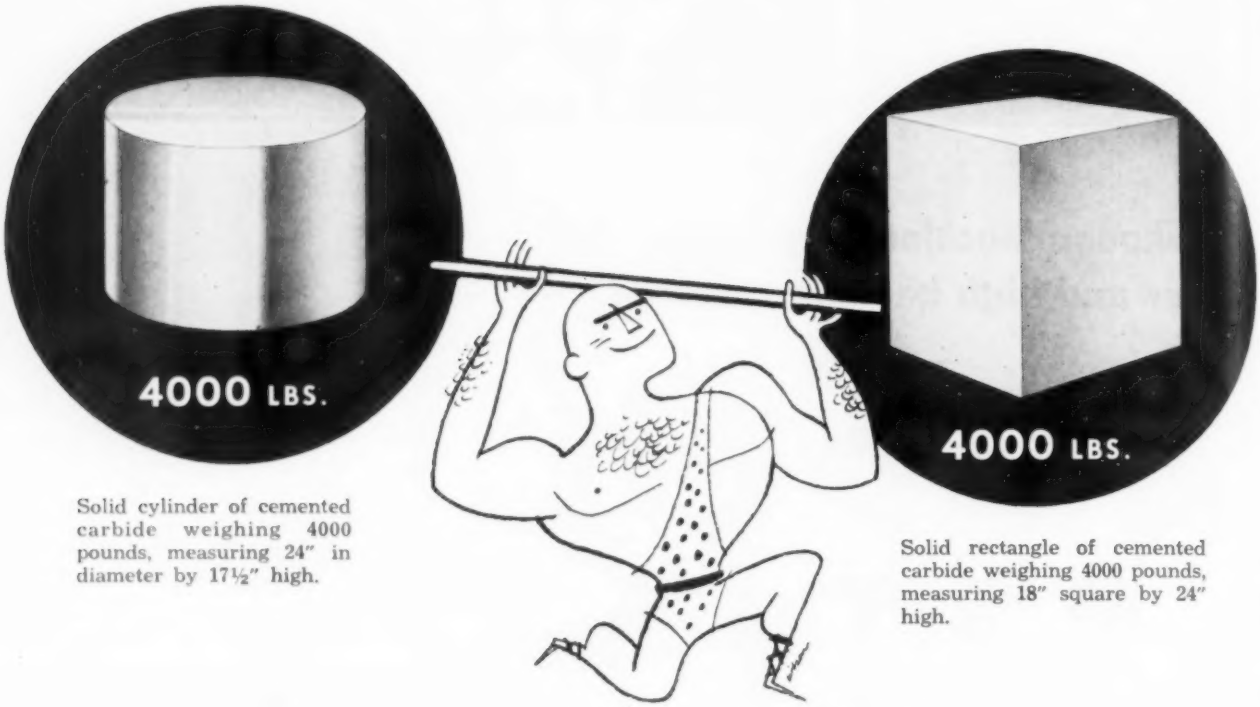
Company.....

Company Address.....

City.....(.....) State.....

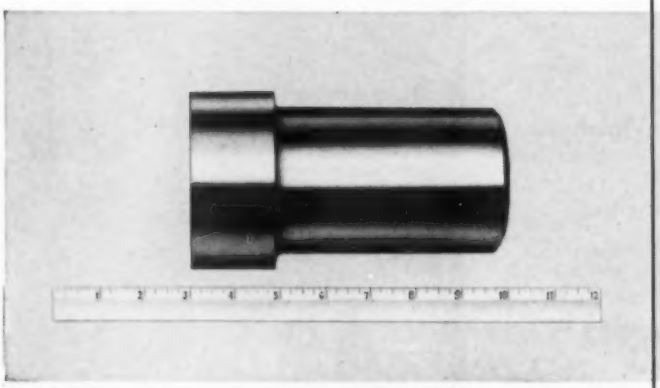
9-24

Now... 2-TON pieces

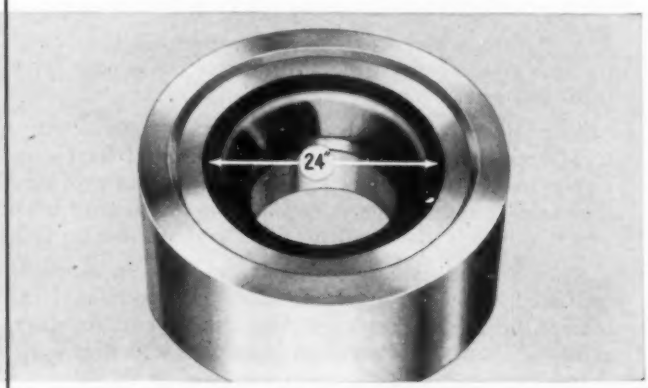


Solid cylinder of cemented carbide weighing 4000 pounds, measuring 24" in diameter by 17½" high.

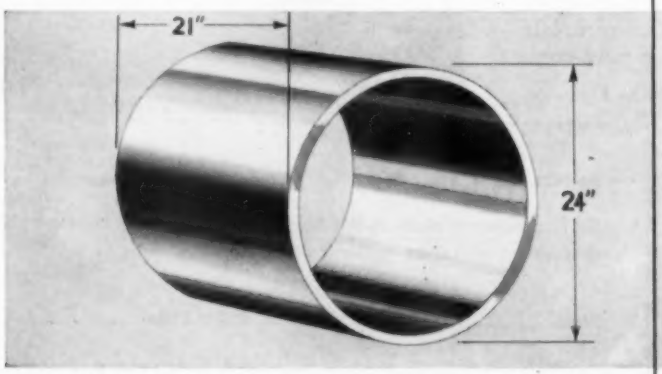
Solid rectangle of cemented carbide weighing 4000 pounds, measuring 18" square by 24" high.



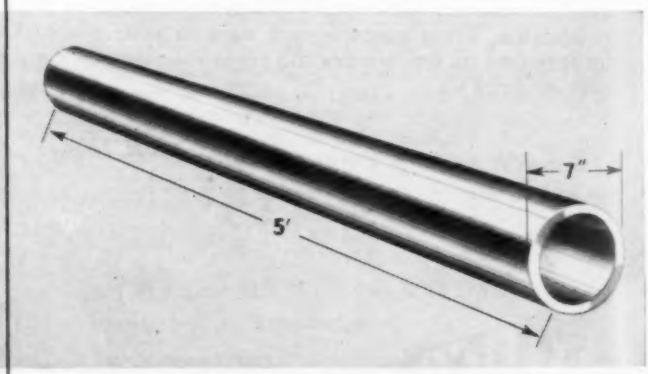
Solid carbide punch used in the cold extrusion of steel.



Ring dies up to 24" I. D. produced one-piece.



Carbide cylinders produced one-piece up to this size.



Carbide cylinders produced one-piece up to this size.

# of Carboloy® cemented carbide

New 220-ton hot press now in operation. Makes carbide pieces in either solid or hollow shapes—in heights up to 5 feet with maximum diameter of 7 inches. Or, in diameters up to 24 inches with maximum height of 21 inches. Up to 4000 pounds in weight. Processing time cut 50% by this method.

Among the many types and shapes the new press can produce are parts for large die sections, rolls for rolling steel strip, punches for cold extrusion work, large linings for brick molds and other parts where the costly factor of wear must be reduced.

Engineers surveying the field. This pressing technique for cemented carbides is so new, applications for it are constantly being developed. Carboloy engineers are helping manufacturers and die makers determine where and how large cemented carbide parts can reduce costs and increase production.

Survey your own plant. Why not survey your own plant for large part applications where wear is a problem. Carboloy engineers can give you specialized assistance. For additional information, please send coupon or write.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11101 E. 8 Mile Street, Detroit 32, Michigan

SURVEY COUPON

Gentlemen:
I would like to determine if large pieces of cemented carbide would reduce costs in the following applications:

_____

_____

Please have a Carboloy engineer ☐ call at plant. ☐ call for appointment.

Name _____ Title _____

Company _____

Address _____ Zone _____

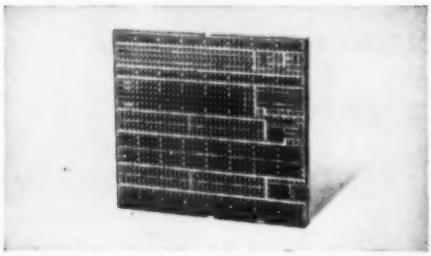
City _____ State _____

Make Sure You're Not Missing These Tooling Advantages!

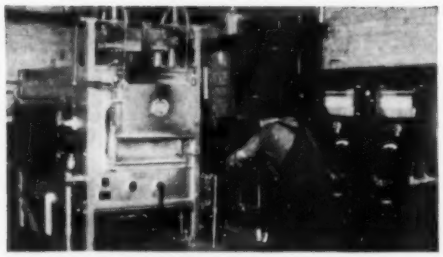
Make this *3-Minute Check* . . . Discover how a *modern* die steel can give you diemaking and production advantages no other steel offers you!

Are you aware of how tool and die steels have been improved in the last 5 to 10 years? New steels are now available that handle easier, run longer between grinds, bring down diemaking costs. Here are facts about *Vega* (Air-Tough) Die Steel—just one steel in Carpenter's Matched Set of 12 modern die steels. Compare *Vega* and what it offers, with the die steel you're using. Check it point by point. You'll see what a difference a Carpenter Matched Tool and Die Steel can mean to *your* production and profits. THE CARPENTER STEEL CO., 154 W. Bern St., Reading, Pa.

Here is what *Vega* gives you . . . *COMPARE* it with the die steel *you* use . . .

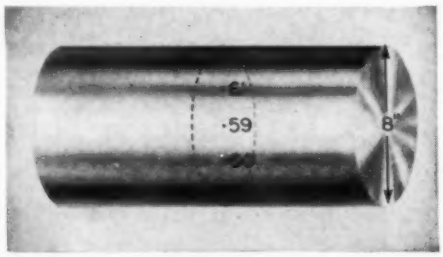


Freedom from Size Change in Hardening. The mold for this 9½" x 10½" plastic control panel has 1,280 $\frac{5}{32}$" dia. holes, six $\frac{3}{8}$" dia. horizontal ports for heating and cooling, plus eight ¾" dia. tapered holes on the edge. *Vega* was the *only* steel of many tried that could successfully hold the close tolerances of .0002" on centers of the 1,280 holes! Will the steel you use behave in hardening like this?

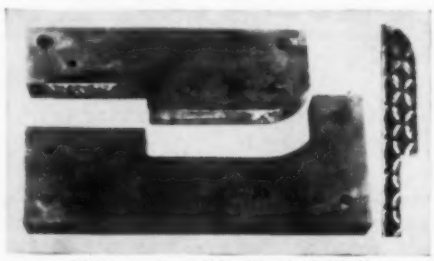


Easy, Low Temperature Heat Treating. You heat treat *Vega* from a temperature of only 1550°F (actually 200°F *lower* than the 5% chromium air-hardening grades!). No need for special, high temperature furnaces! Are you getting the benefits of *low temperature* heat treating from the air-hardening steel you use?

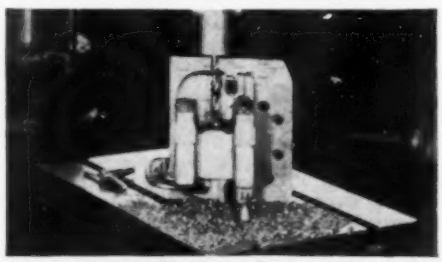
Extra Economy in Hardening. Because of *Vega's* lower hardening temperature, troublesome pack hardening to avoid excessive scaling is usually unnecessary. Does the air-hardening steel you use give you this *extra economy* in hardening?



Uniform Deep Hardenability. *Vega* gives you the advantages of uniform, deep hardenability in very heavy sections. For example, *Vega* hardens to Rockwell C-60 from surface to center in sections as large as 8" round. How does the steel you use compare on this score?



Toughness with Good Hardness. This punch and die blanks ¼" diamond threshold plates at one stroke. With previous air-hardening die steel, tools chipped and broke before any real production was made. With *Vega* these tools are in regular production—and there are no signs of wear or chipping to date. Will the steel you use perform in service like this?



Good Machinability. Unlike ordinary air-hardening grades, *Vega* has a well balanced analysis with a small percentage of hard-to-machine alloys. Field tests prove it to be one of the easiest of all air-hardening grades to machine. If the air-hardening grade you use fails to provide this *good machinability*, you're missing out on lower costs.

change to Carpenter STEEL

Matched Tool and Die Steels

***. . . modern* die steels engineered to meet *today's* requirements!**

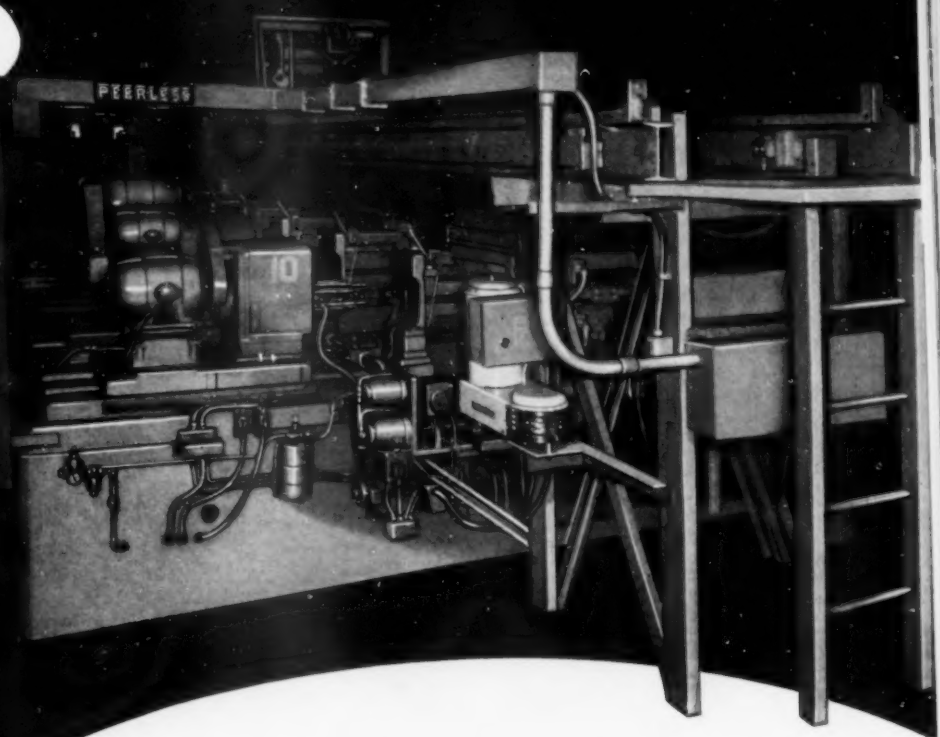
Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Get Immediate Delivery . . . Call your Carpenter Mill-Branch Warehouse, Office or Distributor

PEERLESS

ENGINEERING EXCELLENCE

that does the Never-Before, **NOW**



like the precision work by this transfer machine which replaced an entire department

Before this PEERLESS, an entire department was employed to process various differential carriers.

Now, this PEERLESS takes these raw cast carriers . . . roughs and finishes them . . . and then completes rough-and-finished boring and facing operations, as well as drilling and tapping—

And still holding precision boring and facing tolerances!

Yet this PEERLESS retains the flexibility of an individual-operation setup!

See other examples of PEERLESS Engineering Excellence that does the *Never-Before, NOW!*

Part and Production: Differential Carrier for heavy truck axle. 40 pieces per hour at 100% efficiency.

Type of Equipment: 8-Station Transfer Machine with 5 working, 1 load and unload, and 2 idle stations, utilizing a hydraulically-actuated transfer mechanism for pallet movement. Power-operated overhead pallet-return conveyor and elevators. Peerless 17'-way floor-type Hydraulic Feed Unit. Peerless hydraulically-actuated Bore Face Unit. Colored-light Operator Control Board.

Tooling: Single-place pallet fixtures with automatic positive positioning. Hydraulically-actuated boring and facing heads. Fixed-center ball-bearing drill heads and individual lead-screw tapping heads.

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In precision manufacturing it is vitally important that the original accuracy of gage blocks be *permanent*—that they not become unreliable as a result of the wear characteristic of ordinary steel blocks. Production headaches due to such gage wear will be prevented when you use CROBLOX, Webber Gage Company's revolutionary development in gage blocks. CROBLOX (chrome carbide) gage blocks, due to their extreme hardness and resistance to corrosion, are not subject to "use wear." They *remain* accurate—they give *permanent* service.

May we send you literature describing CROBLOX, the finest gage blocks made—and—your insurance against dimensional inaccuracies.

Only **WEBBER** in the U.S.A. employs Zeiss Opton Interferometer—so incredibly accurate that it detects dimensional variations as infinitesimal as .0000002 of an inch.

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A Gold Mine of Carbide Tool information FREE

Here are just a FEW of the topics in this up-to-date manual

- Selection tables and recommended applications for carbide tools
- Recommended speeds and feeds
- Recommended lubricants
- Tips on how to get top performance from carbide tools
- Selection chart of relief and rake angles
- Carbide grade classification table
- And many other valuable charts and information

It's the new 88 page, 3 color Carbide Tool Manual & Catalog . . . just off the press . . . the most complete compendium of information ever issued in the carbide tool industry.

Not only is this a catalog of the famous ATRAX precision ground tools with engineering, dimensional and performance data on their complete line of End Mills, Reamers, Burs, Countersinks, Boring Bits and Drills . . . but it is an encyclopedic collection of useful information on carbide tools.

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The ATRAX COMPANY, Newington 11, Connecticut.

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How Do You Buy Socket Screws?

Many buyers continue to specify some one make by *habit*. They have no particular preference for it, but they think of *all* such fasteners simply as "screws with hex sockets" — *all* makes substantially *alike*.

If you buy that way, and have never tried P-K Socket Screws, just break the habit once, and give them an actual assembly test. You'll get a pleasant surprise.

You'll find that the hex shape of the socket is about the *only* way that other makes and P-K are "alike".

Look Beyond the Hex

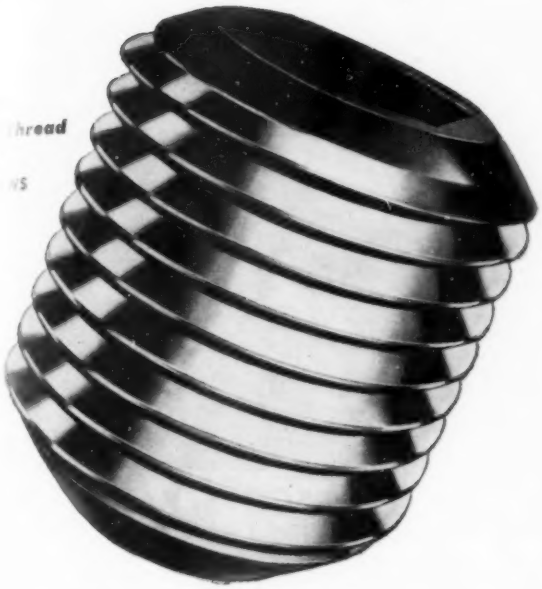
It pays to *look beyond the socket* when you buy Socket Screws. Compare every detail of product and service. You'll find P-K Socket Screws take top rating in every test. You get exclusive features that simplify and speed up assembly. You get quality matched to a firm guarantee. You get planning and buying information exactly patterned to your needs.

You need *all* these essentials for cost-wise assembly. Why miss out on *any* of them? Just try P-K Socket Screws. Get samples from your P-K Distributor, or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

for all the essentials of cost-wise assembly

PARKER-KALON®

IN STOCK for immediate delivery — see the nearby P-K Socket Screw Distributor —



THE FI
Groun hread
SOCKE
SET SC S

In Socket Set Screws
PARKER-KALON gives you

- **GROUND THREADS** — at no extra cost. Gage-like precision, mirror-smooth finish — uniform, dependable Class 3 tolerance. Mechanics like their easy starting, easy keying.
- **PROVED ASSEMBLY STRENGTH** The "proving ground" is the millions of assemblies made by thousands of satisfied users of P-K Socket Screws, whose products are used everywhere, many under the toughest conditions of vibration.

In Socket Cap Screws
PARKER-KALON gives you

- **SIZE-MARK** — offered only by P-K. Incised on the head of each screw, it saves time and wasted screws when sizes get mixed up, prevents errors by green help. Maintenance and service men like Size-mark, it helps in reassembling.
- **GEAR GRIP** Meshing firmly with finger tips, it prevents slipping and fumbling when hands are oily, speeds starting.
- **MAXIMUM STRENGTH** Head, socket, and threads are accurately formed by Parker-Kalon's cold-pressure process. Steel structure "flows" to conform to all contours, assures maximum strength at points of greatest stress.

THE ONLY
Size-Marked
SOCKET
CAP SCREWS

In all Socket Screws
PARKER-KALON gives you

- **GUARANTEED FIRST QUALITY** Based on tests and inspections at every step in production — an exacting routine of quality control supervised by P-K laboratory Technicians.
- **FULL RANGE OF STYLES AND SIZES** You'll find any Socket Screw you need, NC or NF, in P-K's complete line, and Hex Keys in all sizes, and in several handy sets. Ask your P-K Distributor for the P-K Price List, Catalog, — any information you need. Slide chart Socket Screw Dimension Finder Free.

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your local Supply and Service Specialist

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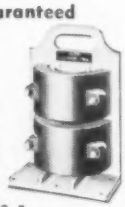

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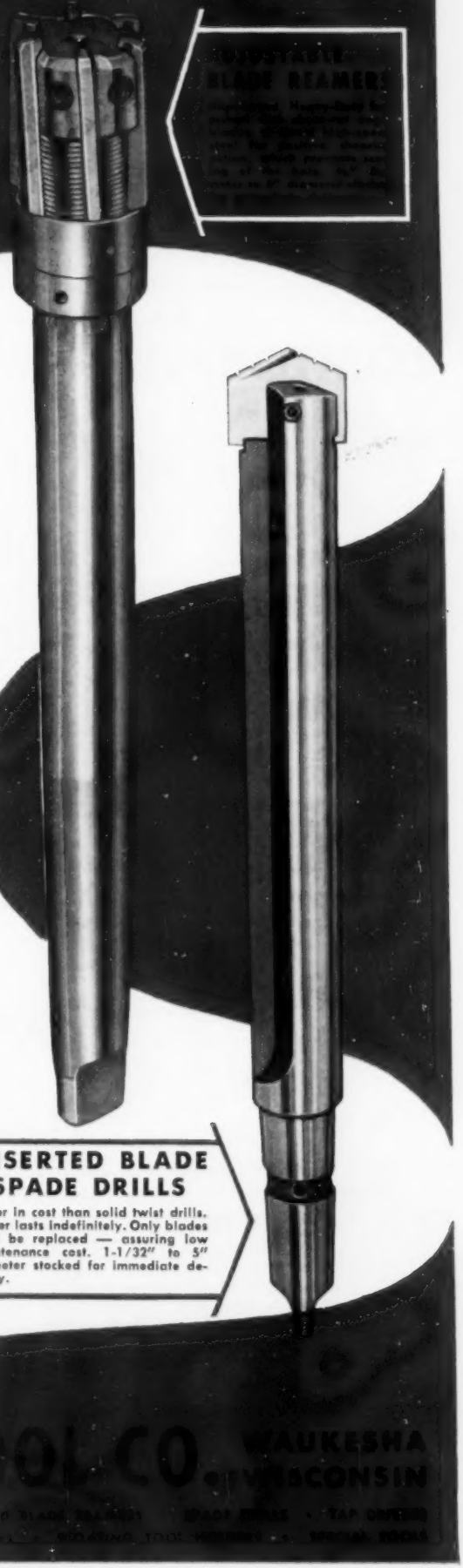

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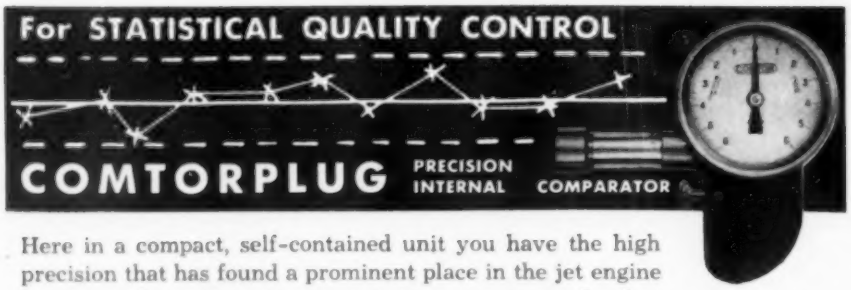

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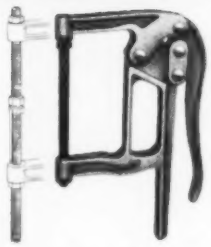

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With this new double-spindle arrangement you can now clamp your work anywhere within the throat gap.

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All models have 2-1/4 throat depth and a clamping force of 1200 pounds.

Above illustrations show 3-7/8 inch throat gap models.

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Model	Size	Wt. lbs.	Price
28	2¾"	2½	$30.00
29	3¼"	3½	32.50
30	4"	6½	35.00
30A	5"	11¾	45.00
31	6"	17¼	50.00
52	7½"	29	75.00
53	9"	43	90.00
54	10½"	62	105.00
55	12"	88	125.00

Universal Four Jaw. Two Sets of Jaws. Two Pinions.

Model	Size	Wt. lbs.	Price
29Y	3¼"	3¾	$35.00
30Y	4"	7	37.50
30AY	5"	12½	47.50
31Y	6"	18¾	55.00
52Y	7½"	29	85.00
53Y	9"	42	100.00
54Y	10½"	62	125.00
55Y	12"	88	150.00

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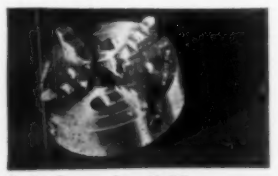
Nickel Steel Operating Screws, Semi-Steel Body. Four Jaw Reversible, Hard Steel Jaws.

LIGHT

Model	Size	Wt. lbs.	Price
35A	3¼"	2¾	$15.00
35B	4"	4	17.50
35C	4½"	5	18.50
36	5"	7½	24.00
34	6"	10	25.00
37	8"	18¼	36.50



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39	6"	17	$37.50
40	8"	36	50.00
41	10"	60	60.00
42	12"	85	70.00
43	14"	104	80.00
44	16"	138	92.50

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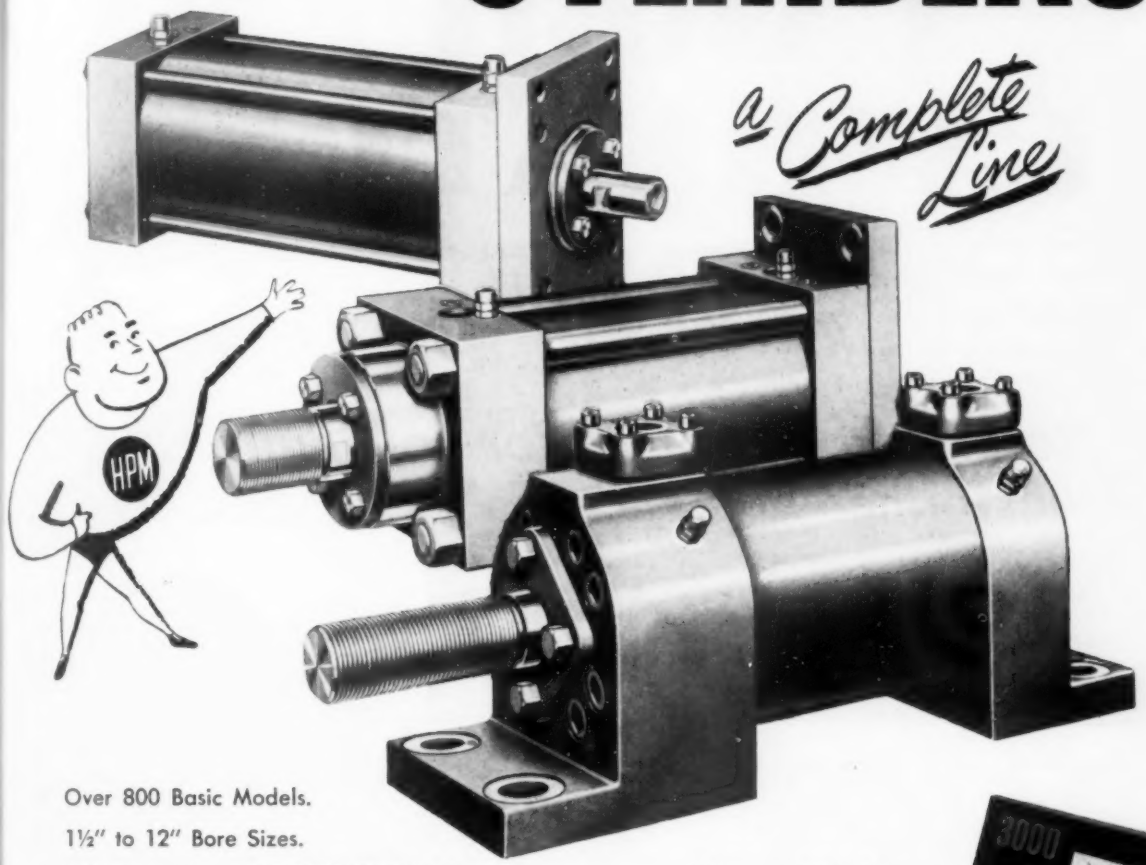
a Complete Line



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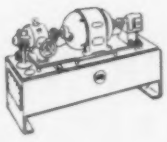
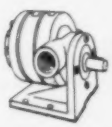


PUMPS & MOTORS



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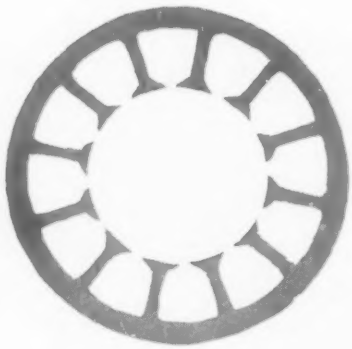

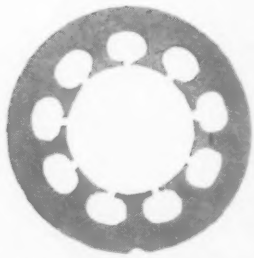

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UNI-V-BLOCKS are made of forged, close-grained Chrome-Moly alloy steel. The exclusive, new FROZONE process for hardness and stability (developed by Precision Tool) makes UNI-V-BLOCKS *the closest thing to absolute perfection*, on the market today!

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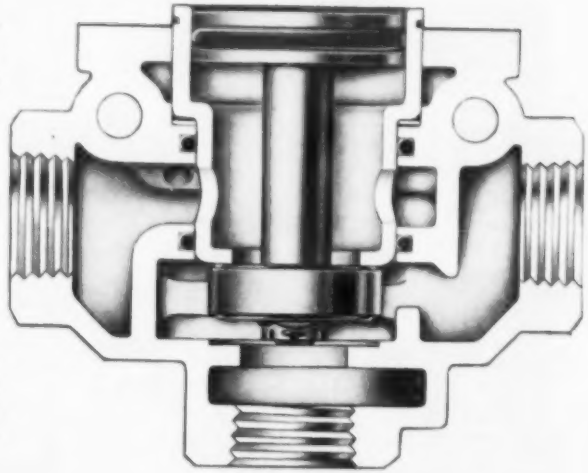
The Most Versatile Family of Valves Ever Designed and Built for the Directional Control of Air!



Everything you need from the simplest to the most complicated air-operated circuit can be accomplished with these valves. Included are 2-Way, 3-Way and 4-Way Master Valves and solenoid Pilot-Master Valves...direct-operated 3-Way Pilot Valves in a wide choice of operating heads...and a brand-new series of small direct-operated 4-Way valves. Plan now to get acquainted with these fast-acting, full-area control valves...there's a Hannifin representative near you who will introduce you to their many money-saving advantages.

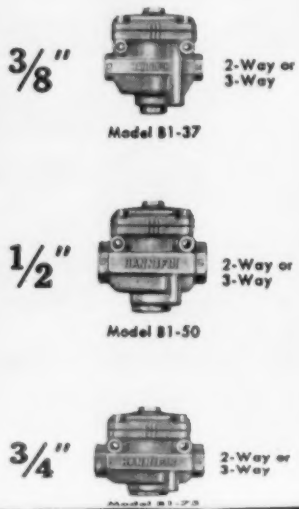
P-M Pilot Valves

Direct-operated 3-Way ¼" (⅜" tapping optional) poppet-type valves for use as "pilot" valves for remote control of P-M Master Valves or direct control of small cylinders.

C1-25 Solenoid Spring Return
C5-25 Hand Locking
C4-25 Hand Non-Locking
C3-25 Palm Button
C7-25 Foot Locking
C6-25 Foot Non-Locking
C2-25 Cam Ball Type
C8-25 Toggle Operated
C9-25 Over-Riding Cam Type
C10-25 Pressure Operated
C13-25 Cam Roller Type
CS1-25 Sequence Valve

P-M Master Valves
Pressure operated

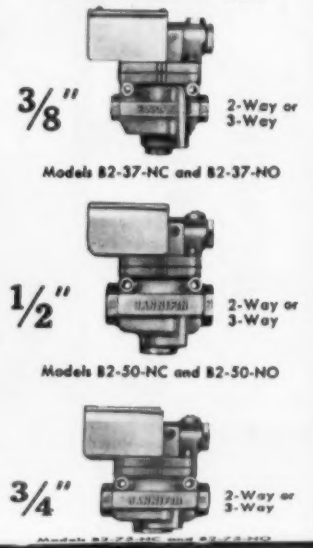
For remote control from a 3-Way P-M Pilot Valve. Series B-1, 2-Way and 3-Way; Series BB-1, 4-Way.



⅜" 2-Way or 3-Way — Model B1-37
½" 2-Way or 3-Way — Model B1-50
¾" 2-Way or 3-Way — Model B1-75

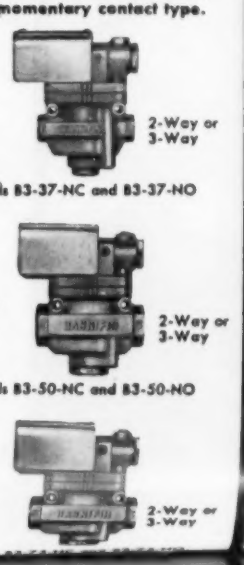
P-M Pilot-Master Valves
Solenoid-controlled by integral pilot heads...

Series B-2, 2-Way and 3-Way spring return type; Series BB-2, 4-Way spring return type.



⅜" 2-Way or 3-Way — Models B2-37-NC and B2-37-NO
½" 2-Way or 3-Way — Models B2-50-NC and B2-50-NO
¾" 2-Way or 3-Way

Series B-3, 2-Way and 3-Way pressure return type; Series BB-4, 4-Way momentary contact type.



⅜" 2-Way or 3-Way — Models B3-37-NC and B3-37-NO
½" 2-Way or 3-Way — Models B3-50-NC and B3-50-NO
¾" 2-Way or 3-Way

Basic P-M Advantages

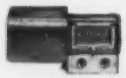
- **Removable cartridge contains piston-poppet. Only moving part of main valve. Springless. Replaceable without disturbing main piping. Two cartridge sizes fit all five valve sizes.**
- **2-Way and 3-Way valves operate N.O. (normally open) or N.C. (normally closed). Buy them either way or convert them on the job.**
- **Interchangeable: Same head fits every size valve body in any given series. Same body fits three different heads in every pipe size.**
- **Snap action. Speeds of 600 cycles per minute entirely practical with solenoid models.**
- **For any pressure from 15 to 150 p.s.i., gas or air. Higher pressures permissible when water or oil is the fluid.**

P-M Direct-Operated

SEE

P-M Direct-Operated 4-Way Valves

Direct-operated 4-Way ¼" (⅜" tapping optional) poppet-type valves for control of small double-acting cylinders.



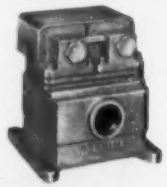
CC1-25 Solenoid Spring Return

CC11-25 Solenoid Momentary Contact

CC2-25 Cam Ball Type — CC4-25 Hand Non-Locking — CC5-25 Hand Locking

CC7-25 Foot Locking — CC6-25 Foot Non-Locking — CC10-25 Pressure Operated

P-M Pilot-Master Dual 3-Way Valve



Two 3-Way Pilot-Master Valves mounted in common body. Both pilot valves and main valves pneumatically interlocked so unit "fails safe." For completely safe operation of mechanical presses. ⅜" and 1¼" sizes.

1" 2-Way or 3-Way

Model B1-100

1¼" 2-Way or 3-Way

Model B1-125

⅜" 4-Way

Model BB1-37

½" 4-Way

Model BB1-50

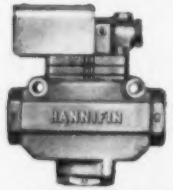
¾" 4-Way

Model BB1-75

1" 2-Way or 3-Way

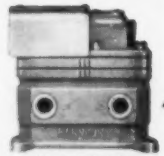
Models B2-100-NC and B2-100-NO

1¼" 2-Way or 3-Way



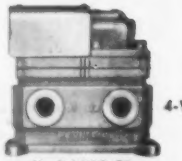
Models B2-125-NC and B2-125-NO

⅜" 4-Way



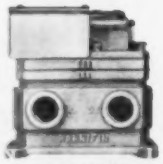
Model BB2-37

½" 4-Way



Model BB2-50

¾" 4-Way

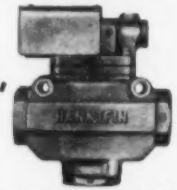


Model BB2-75

1" 2-Way or 3-Way

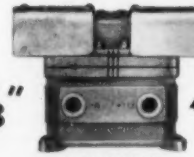
Models B3-100-NC and B3-100-NO

1¼" 2-Way or 3-Way



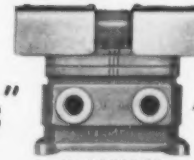
Models B3-125-NC and B3-125-NO

⅜" 4-Way



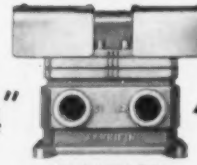
Model BB4-37

½" 4-Way



Model BB4-50

¾" 4-Way



Model BB4-75

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MONEY AND TIME SAVING FEATURES . . .

See WALES Equipment in operation at the ASTE SHOW in Philadelphia APRIL 26-30 BOOTH 1830

"NOT ONLY PAID FOR THESE WALES UNITS AND THE PRESS BRAKE BUT ALSO MADE OUR NORMAL PROFIT ON THE JOB"

"SETUPS WITH WALES UNITS ARE 8 TIMES FASTER THAN OUR FORMER GANG PUNCHING METHODS"

"ABLE TO DOUBLE THE RATED PRESS CAPACITY BY STAGGERING SHUT HEIGHT OF WALES UNITS WITH CAPS ON TOP OF PUNCHES"

"ELIMINATE STRIPPING PROBLEMS, SPOILED WORK FROM IMPROPER STRIPPING, AND BROKEN PUNCHES"

BLOOMER HEATING & VENTILATING CO.

Contractors - Fabricators

1857 WEST 47th STREET · CHICAGO 9, ILL.
FRontier 6-2222

February 26, 1954

Wales-Strippit Corporation
408 Madison Avenue
Oak Park, Illinois

Attention: Mr. Homer C. Gray

Gentlemen:

Very seldom in the operation of a fabricating plant have I come across such cost and time saving opportunities as have been made possible by Wales Hole Punching Units.

To give you a little background, my company bid a job, based on our former gang punching method of tooling, and after we received the order as low bidder, I investigated and bought Wales Units. In addition, we purchased another press brake. The cost records show that we not only paid for these Wales Units and the press brake with this one job but also made our normal profit on the job. We also bettered our delivery estimate by six weeks. Since the completion of this first order I have been using these same Wales Units on similar jobs.

My experiences have proven that setups with Wales Units are eight times faster than our former gang punching methods. Press down-time between setups is practically eliminated by mounting these Units on templates outside the press and just placing the entire assembly on the press bed, ready to start punching.

We were able to double the rated press capacity by staggering the shut height of Wales Units with caps on top of punches. Your Wales Units eliminate stripping problems, spoiled work from improper stripping and broken punches.

I thought you would be interested in these highlights of my experience with your tooling equipment and so I am enthusiastically passing along to you the results of my experiences with Wales Hole Punching Units. I am also enclosing photographs of your equipment in operation.

Very truly yours,

BLOOMER HEATING & VENTILATING COMPANY

E. Ellis

E. Ellis
Plant Superintendent

EE:rp

This letter from Bloomer Heating & Ventilating Company points out typical time saving and money saving advantages that are also experienced by the thousands of users of Wales Hole Punching Units.

Patented, independent, self-contained Wales Units permit the same group of units to be used and reused in unlimited hole punching setups without aligning punches and dies in the press.

Write for the fully-illustrated, functionally colored catalogs that completely describe Wales Hole Punching Units.

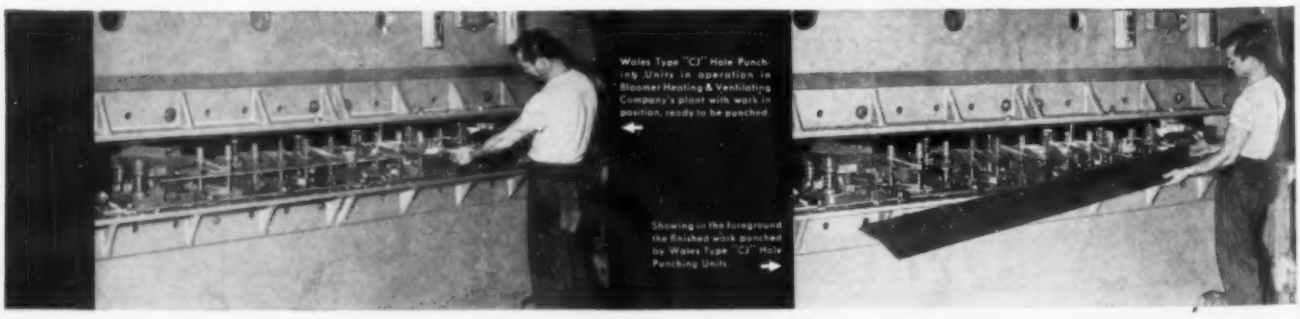
WALES-STRIPPIT CORPORATION

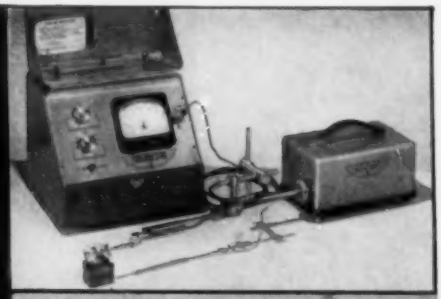
George F. Wales, Chairman

393 **Payne Avenue, North Tonawanda, N. Y.**
(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment


Wales Type "CJ" Hole Punching Units in operation in Bloomer Heating & Ventilating Company's plant with work in position, ready to be punched.
Showing in the foreground the finished work punched by Wales Type "CJ" Hole Punching Units.



SURFINDICATOR*
meets every surface measurement problem

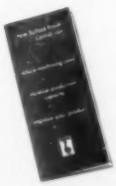
The standard pickup for the SURFINDICATOR is hand operated, permits measurement of virtually all shapes, from 5/16" O.D. to 1/8" I.D. The new accessories shown above—motor drive and small bore adapter—extend the usefulness of the instrument. Motor drive speeds inspection where large numbers of identical parts are involved. Adapter permits measurements in very small diameters—as small as 1/8" I.D.—and other limited areas.

*Trade Mark

See how easy it is to measure **SURFACE ROUGHNESS**

Time-consuming laboratory setups to determine surface roughness are now a thing of the past. With the Brush SURFINDICATOR* you can check surface roughness instantly – anywhere –even when the part is mounted in a machine tool as shown above.

The new ease of measuring surface roughness permits you to control this production variable–which affects machining costs, appearance, friction, wear, product life and many other characteristics. Finish can be specified in blueprints and quickly checked in the shop. The operator simply guides the pickup over the surface and reads roughness in microinches directly on the meter. No calculations are required and accuracy of the instrument can be checked at any time against Precision Reference Standards.



TRY IT YOURSELF! Write for a copy of this booklet on Surface Finish Control. Or, ask for a demonstration of the SURFINDICATOR in your plant by a Brush engineering representative. Send coupon now. Brush representatives are located throughout the U. S. In Canada: A. C. Wickman, Limited, Toronto. Brush Electronics Company, Cleveland 14, Ohio.

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☐ Please send free copy of "Surface Finish Control".

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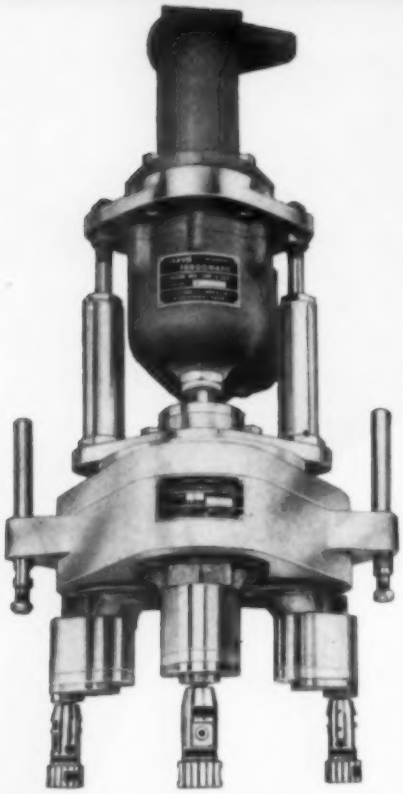
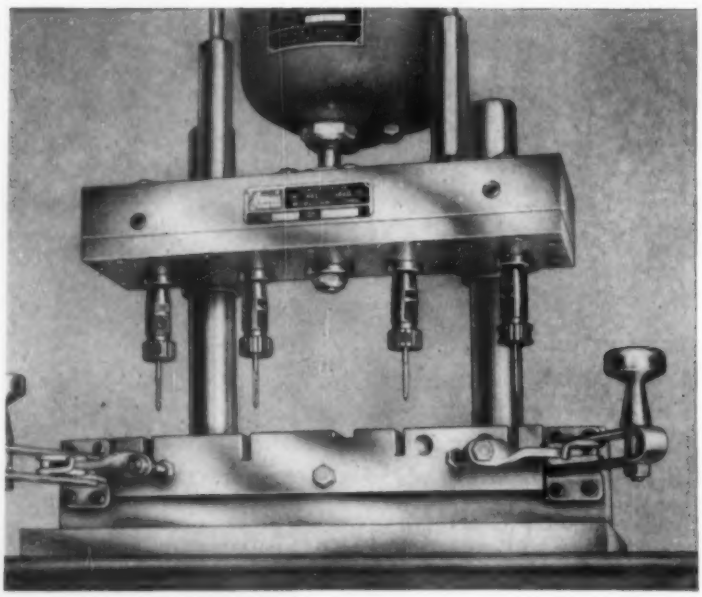
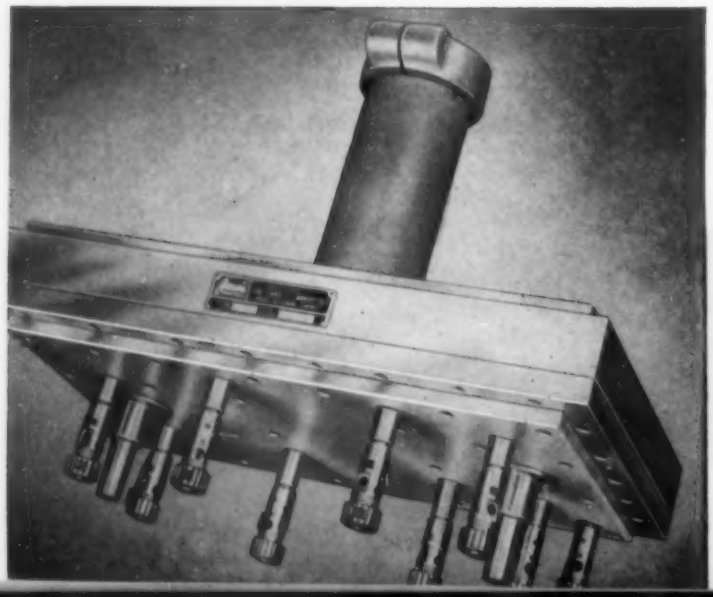


Jarvis MULTI-TAPPERS

AN INDUSTRIAL MACHINE FOR INDUSTRIAL USE





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Engineered and built to your specific production requirements from our basic standard components, Jarvis Multi-Tappers can be furnished for any type of drill press available.

We invite your inquiries—let us assist in analyzing your tapping and drilling needs!

Send for our catalog featuring Jarvis Multi-tapper

WHEN POWERED WITH A JARVIS TORQOMATIC DRIVE THE JARVIS MULTI-TAPPER PROVIDES THE MOST EFFICIENT AND PRODUCTIVE MACHINE IN THE FIELD.

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MIDDLETOWN IN CONNECTICUT

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AN INDUSTRIAL TAP FOR INDUSTRIAL USERS

have "Custom Made" Cutting Edges at NO EXTRA CHARGE

"Custom Made" means just that! Accurate indexing and precision machine grinding of flute and spiral points on Jarvis Taps produce a tool in which ALL the cutting edges do their share of the work. Our highly accurate fluting process makes it possible for us to control for your PARTICULAR NEEDS the amount of hook ground in the flutes. Specify Jarvis, and you'll always have "Custom Made" Taps designed to do a specific job superbly well.

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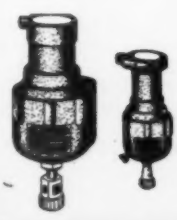
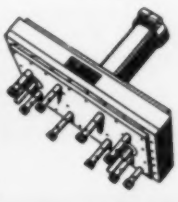


MULTI-TAPPING AND DRILLING



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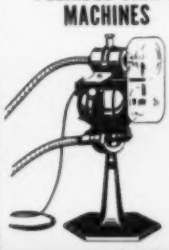
FLEXIBLE SHAFT MACHINES



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THE CHARLES L. JARVIS COMPANY, MIDDLETOWN IN CONNECTICUT

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ENGINEERING ADVISORY SERVICE . . . YOURS FOR THE ASKING

Tooling engineers in thousands of plants across the country have found they can turn to HIGH SPEED—not only for fine production equipment—but for HIGH SPEED'S exclusive production analysis service. We can help you too.

If you have an assembly problem that involves staking or riveting, call on us. Just send along prints and parts to be assembled. In less than a week we'll return a sample assembly properly riveted or staked, with complete recommendation and guaranteed rates. We'll also include a firm quotation on the HIGH SPEED Model to do the job, but THERE'S NO COST OR OBLIGATION. Send us your assembly problem today!

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AUTOMATIC STAKING MACHINE

Designed for rugged, high speed production line service. Heavy duty double-action spindle features pressure pad that 1. secures work for blow, 2. delivers uniform blow every time, and 3. allows for variation in thickness. Quickly and easily adjusted, with wide power range. Bench and Pedestal models, foot or air operated.

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Speed up production line riveting, improve quality standards with High Speed Cold Riveters. 10 Models handle full range of work to 2" diameter solid rivets. Bench and Pedestal types. Quick to set up or change tools. High Speed dependability backed by finest, most complete tooling service in the industry. Send for literature.

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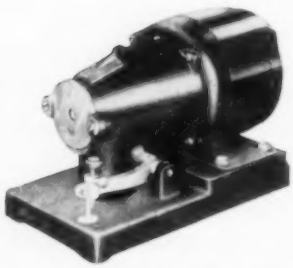

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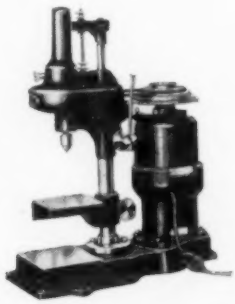
Completely removes any type of insulation (including new plastic types) from solid, strand or multi-conductor cable up to ½" diameter. Stripping lengths up to 1½". Works instantly . . . easy to use . . . simple to adjust. Three exclusive cutters center cable for accuracy and give more and sharper cutting edge. Comes with ¼ H.P. 110-volt single phase AC motor, cord, switch and plug. Cut production costs with HIGH SPEED.



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Sturdily built . . . but so sensitive that operators actually "feel" drill progress . . . slashes breakage costs. An accurate, precision drill for handling all types of work from No. 80 to ¼". Heat treated and ground spindle guided in vertical quill, supported by annular bearings to eliminate belt pull. Rugged thrust bearings carry full drilling load. Table heights, spindle travel, speeds quickly adjusted. Available in bench and pedestal and multiple spindle models.

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HIGH SPEED HAMMER CO., INC.

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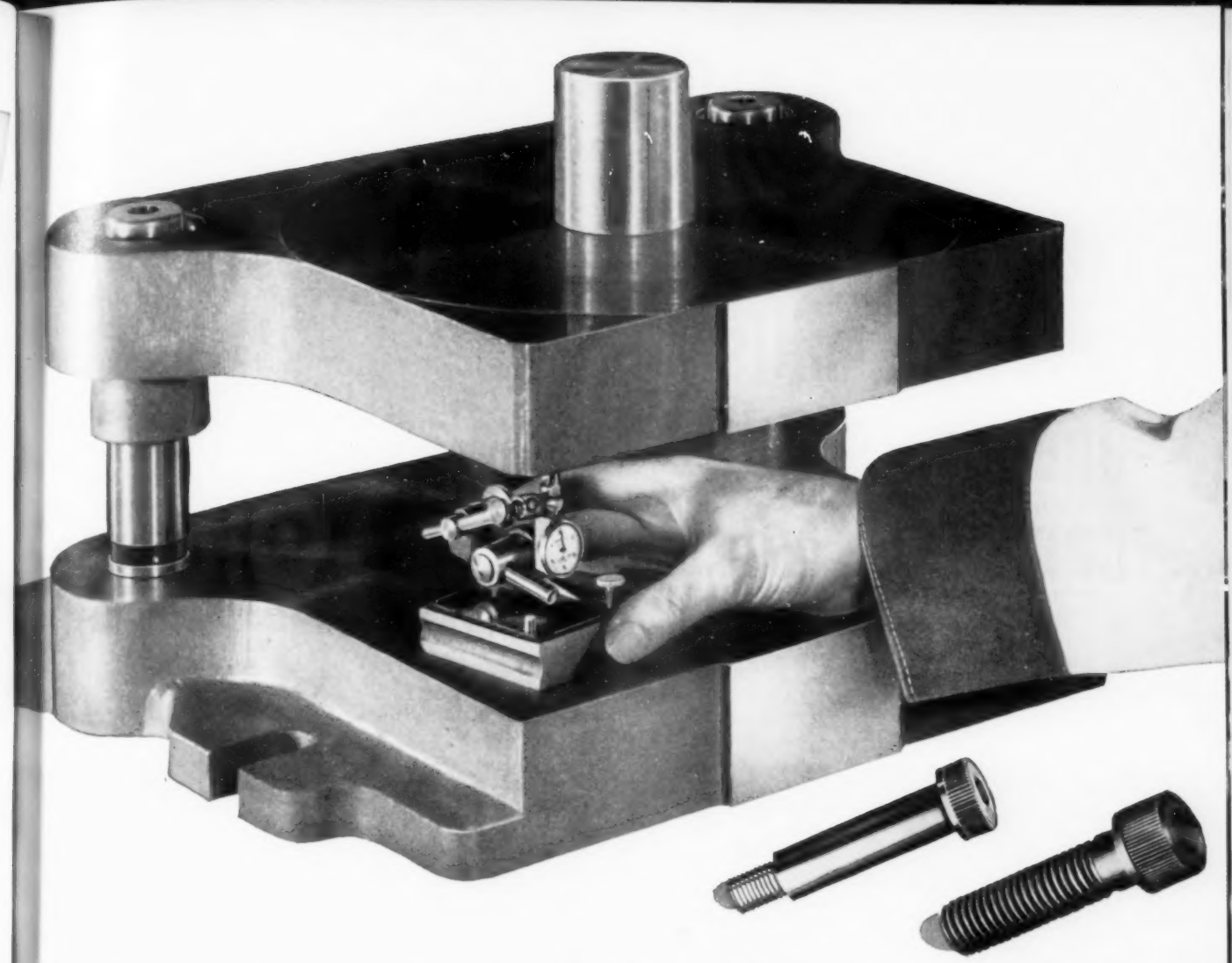

DIEMAKERS DEPEND ON DANLY FOR DIE SET ACCURACY

When it comes to meeting the precision requirements of the finest die work, diemakers everywhere *depend on Danly* Die Sets and Danly Diemakers' Supplies for accuracy. Precision machining, grinding, lapping and honing provide smooth, long-wearing surfaces with dimensional accuracy held within extremely close tolerances. On every component part, rigid inspection standards guard Danly quality.

Danly accuracy saves countless hours in the die shop, makes tooling-up much faster, insures longer production runs at lower cost. Why not bring Danly into your diemaking plans and get the results you're looking for. Remember, there's a Danly Branch near you. They're stocked for immediate delivery.

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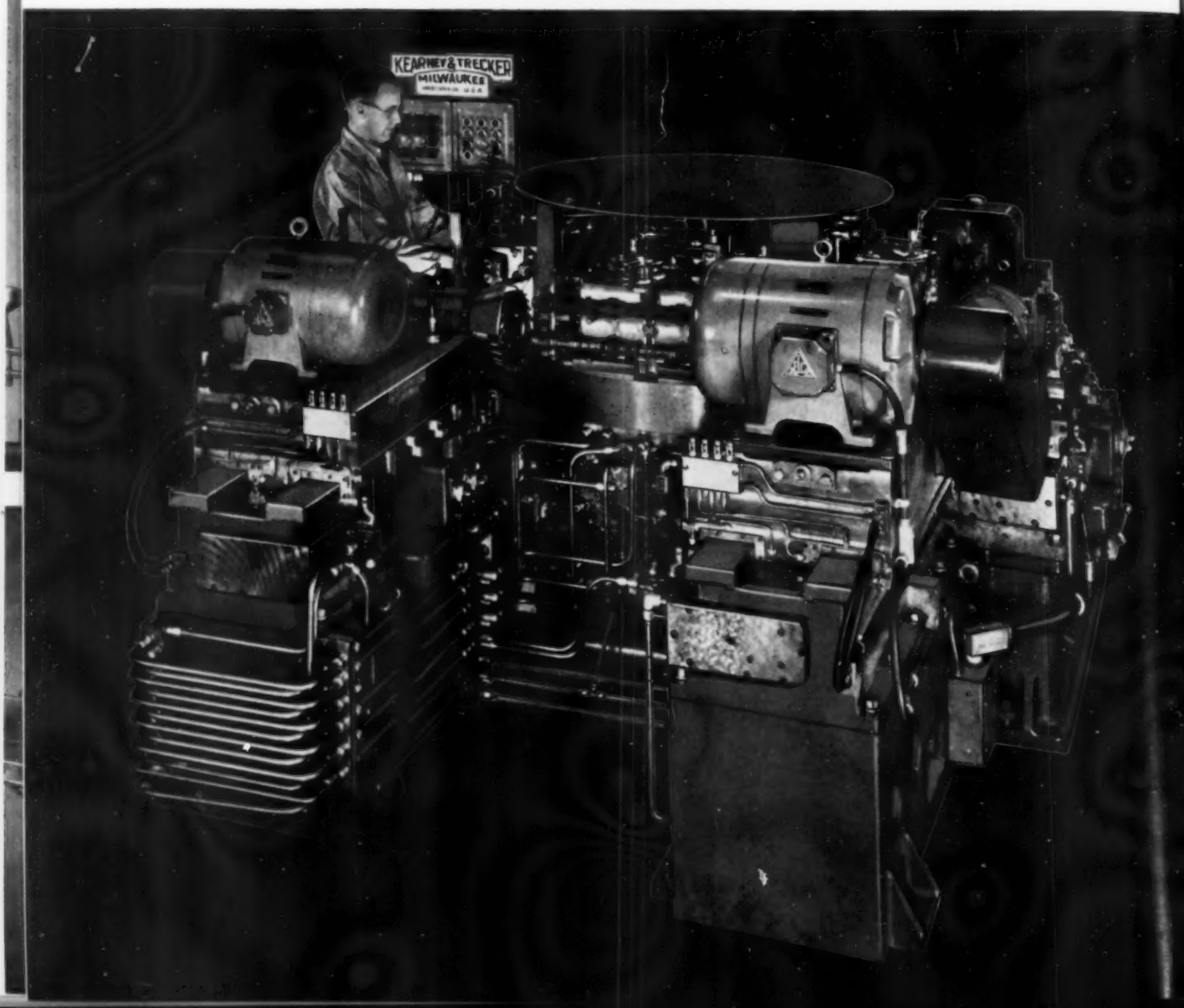
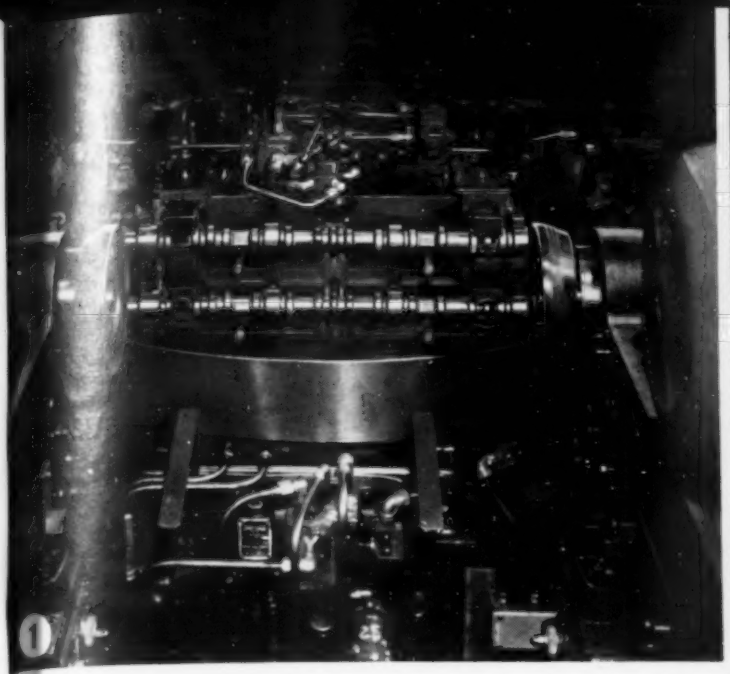
PRODUCTION MACHINING REPORT:

New production machine mills and drills 288 camshafts hourly

THREE of these high production, four-station rotary indexing machines were recently installed by one of the world's largest automotive manufacturers. A particularly interesting aspect of the machines — which were designed and built by Kearney & Trecker — is the fact that standard units were utilized wherever possible. This not only moved up the delivery date, but also resulted in a dramatic saving in cost. See photos 1, 2 and 3 for the sequence of operations which results in production of 288 cast iron camshafts per hour per machine.

Basically, the machine is comprised of a 60" rotary indexing table and base . . . two milling units, each with one spindle . . . one drilling unit with two spindles . . . and a second drilling unit with four spindles.

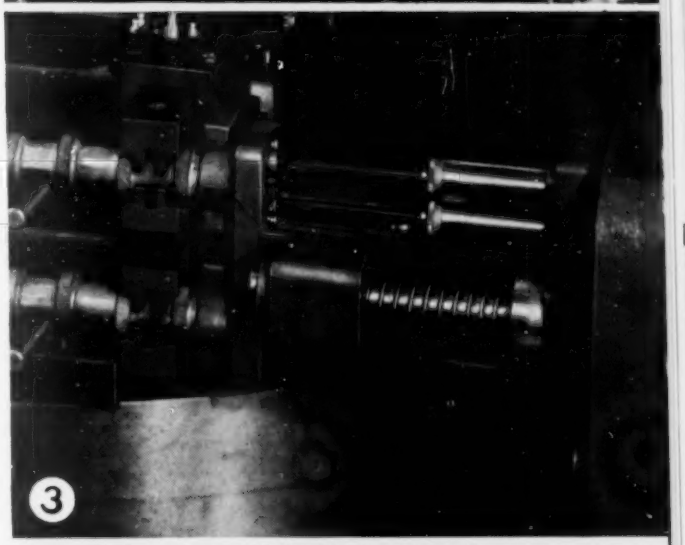




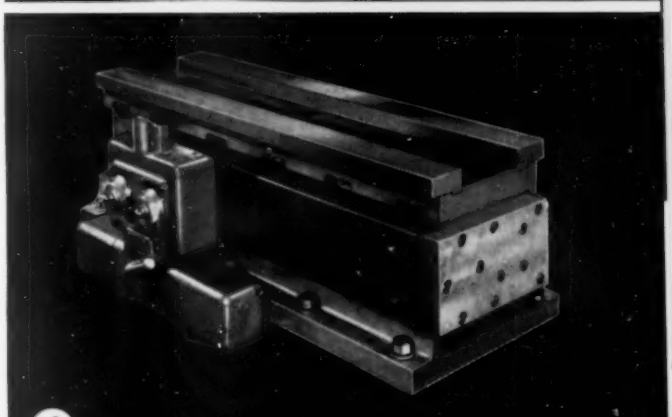
1. After 2 workpieces have been manually loaded, table indexes automatically to station 2, where both ends are milled to length. Each milling unit has a 10" dia. face mill with 36 T.C. inserted blades. Left hand head is powered by a 7½ hp motor. Right hand head by a 10 hp motor.

2. Table automatically indexes to drilling station and camshafts are center-drilled on each end. Drilling units are powered by a 1 hp motor. (Motor partially cut away to show drilling). Each of 4 hydraulic clamping and equalizing fixtures holds 2 workpieces. Location of workpiece is taken from end body diameters with end location from the center bearing.

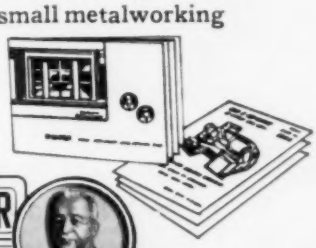
3. At the final station there is a 2 hp drilling head which carries 4 spindles. Two drive holes are drilled in one end of each camshaft. Spindles operate at fixed speeds.



Here are two of the components which make major contributions to the machine's performance at reasonable cost. TOP: This is the feed slide unit. It is available in four standard sizes. All sizes feature a hydraulic control panel which can be mounted at either side... hardened and ground ways... a massive one-piece base casting which absorbs vibration. BOTTOM: This 24" rotary indexing table is one of four standard sizes available. Each table can be arranged for any practical number of indexes or for continuous rotary feed.



For more comprehensive facts on this machine and its standard units, write for Data Sheets No. 1018, No. 1019 and No. 1020. For details on the facilities and engineering services offered by our recently expanded Special Machinery Division, see your representative or write for booklet, "Doorway to a proven method for solving big or small metalworking problems." Kearney & Trecker Corp., 6784 West National Ave., Milwaukee 14, Wisconsin.

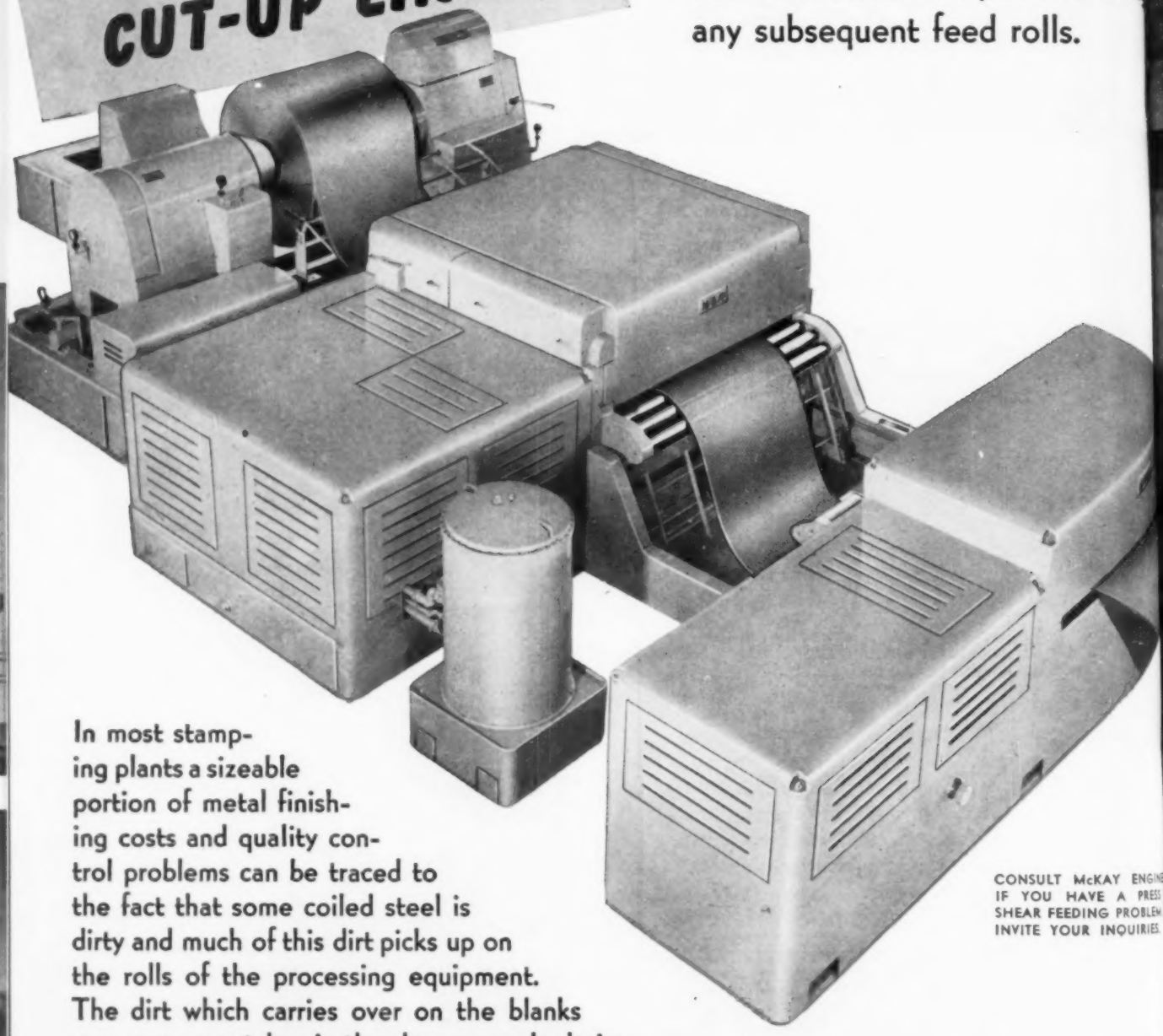


KEARNEY & TRECKER
CORPORATION
Special Machinery Division
MILWAUKEE 14, WIS., U. S. A.

McKAY PRESS FEED AND CUT-UP LINES

WASH THAT DIRTY ST
BEFORE SHEARING and BL AN

The latest development in Mc coil feed lines is this new st washing machine which thorou cleans the strip after it leaves t coil and before it passes throu any subsequent feed rolls.



In most stamping plants a sizeable portion of metal finishing costs and quality control problems can be traced to the fact that some coiled steel is dirty and much of this dirt picks up on the rolls of the processing equipment. The dirt which carries over on the blanks may cause scratches in the drawn panels during the forming operations.

In several recent installations McKay has furnished a strip washing machine which utilizes high speed brushes and large volume s vent sprays to thoroughly clean the st strip at high production speed.

CONSULT McKAY ENGIN IF YOU HAVE A PRES SHEAR FEEDING PROBLEM INVITE YOUR INQUIRIES.

The McKAY MACHINE Company
YOUNGSTOWN, OHIO

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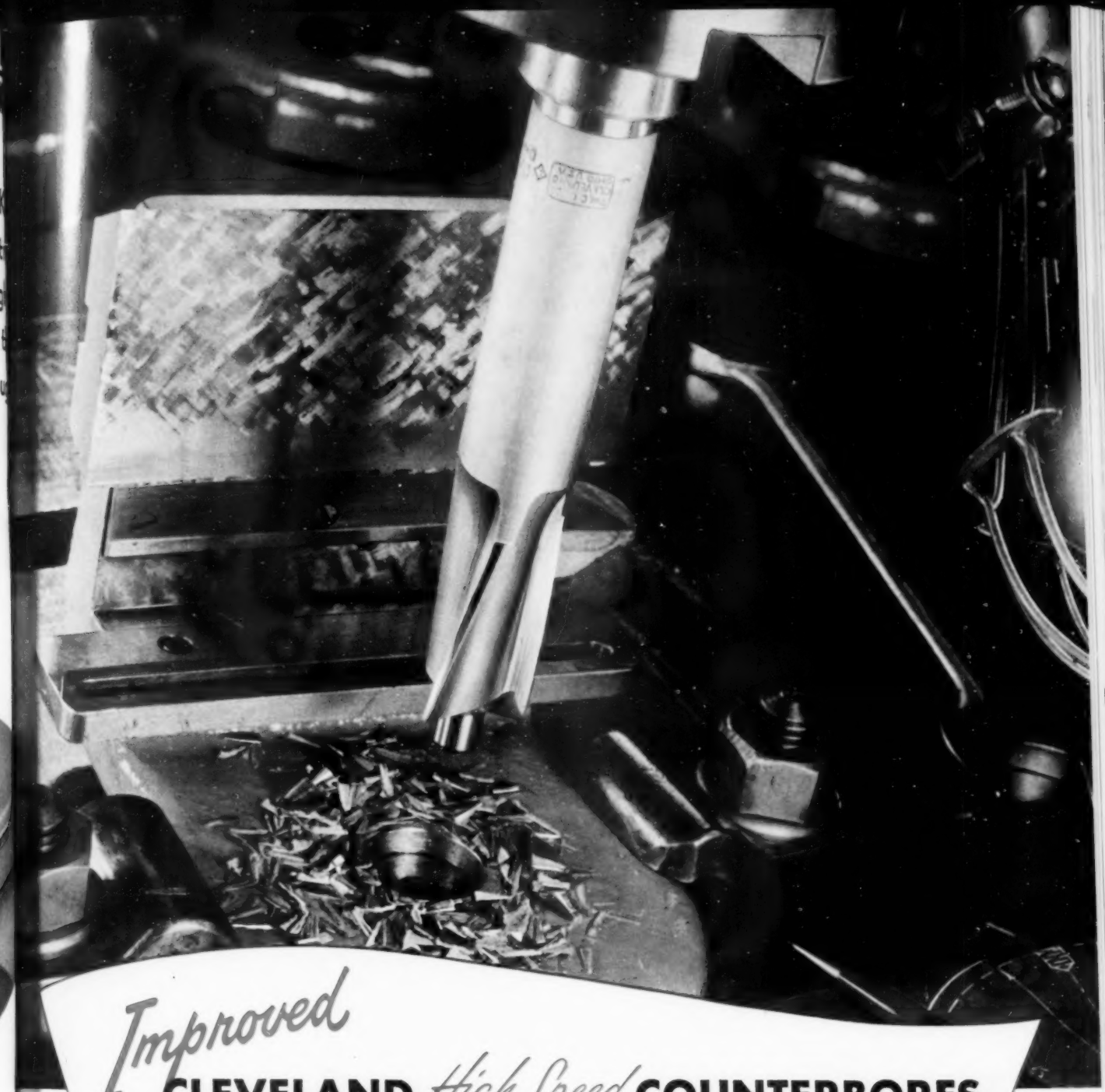
ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMO FABRICATING AND STEEL IN



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CLEVELAND *High Speed* COUNTERBORES

New Flute Design for More Efficient Chip Removal

Deeper flutes eliminate "packing" of chips and reduce tool breakage . . . enable you to counterbore the full length of the flutes. This *superior tool* also gives you the *economy* of interchangeable pilots. It requires no holders or adapters. ◈ A test will prove the outstanding features of these improved CLEVELAND Counterbores.

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The sleeve bearing is not complex in structure; it conforms readily to design requirements; it is easily installed. Cast Bearing Bronze is the most adaptable of all sleeve bearing materials; it possesses excellent anti-friction properties. With proper film lubrication, its coefficient of friction is as low as can be obtained with any other bearing type. A successful Bunting Bronze bearing installation is readily attainable. We ask the opportunity to work with you, and to quote on your requirements.

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FOR THESE INGERSOLL HEAVY DUTY GENERAL PURPOSE FACE MILLS

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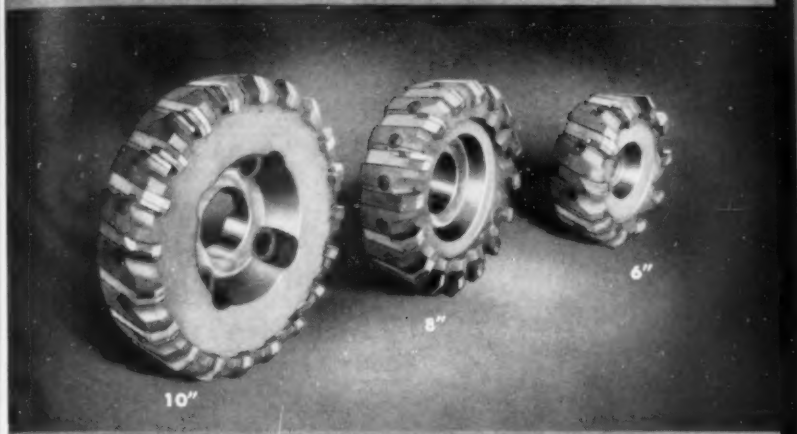
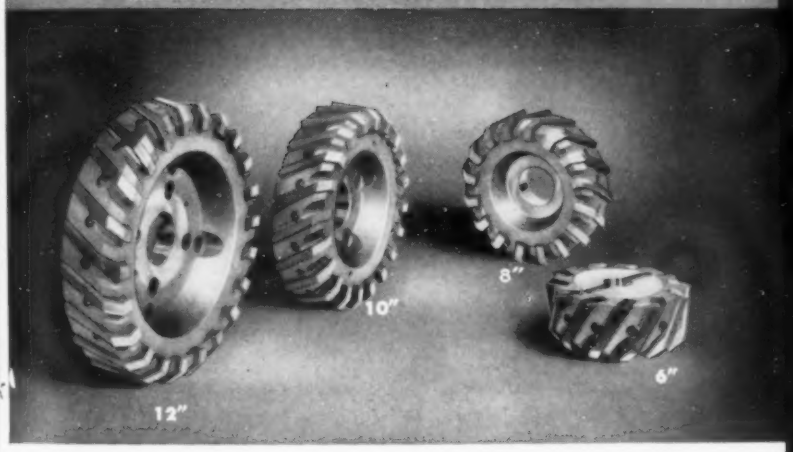
Replacement blades for all of these cutters and for many others also are in stock.

Improved manufacturing facilities and techniques have expanded our capacity to give you good service on all of your requirements for inserted blade milling and boring tools.

SHEAR CLEAR FACE MILLS with high speed steel blades . . . for cast iron, steel or aluminum



SHEAR CLEAR FACE MILLS with carbide-tipped blades . . . for cast iron . . . for steel



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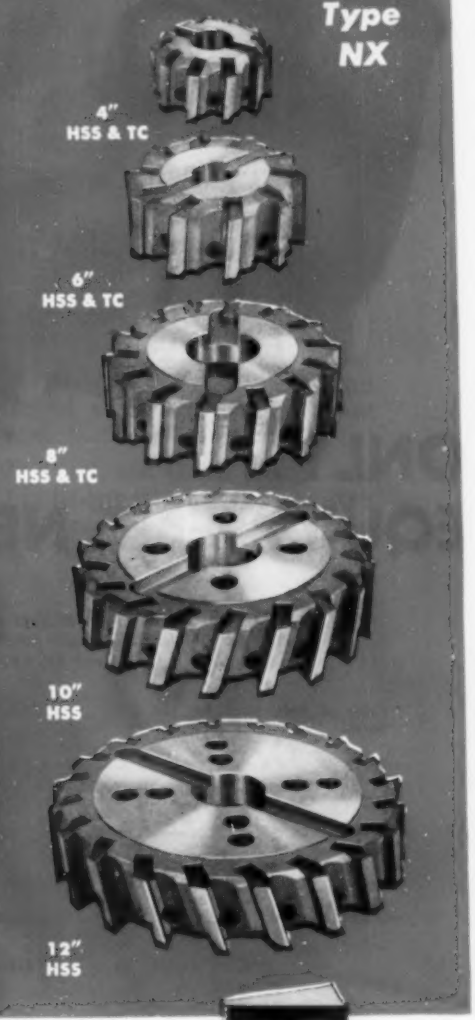

SHOWN ON PAGES 9, 12, 14, 18 & 19 of Cutter Catalog No. 60F. Write for your copy today.

THE INGERSOLL MILLING MACHINE COMPANY
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BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF SHEAR CLEAR CUTTERS

THE *Van Keuren* GEAR MEASURING SYSTEM

Set 26EX-Gear Measuring Wires, accurate to ±.000025", for common diametral pitch external spur gears.

VAN KEUREN GEAR MEASURING WIRES PROVIDE THE MOST ACCURATE AND LOW COST METHOD OF MEASURING THE TOOTH THICKNESS OF SPUR AND HELICAL GEARS, INVOLUTE SPLINES AND INVOLUTE SERRATIONS.

ONLY... EQUIPMENT NEEDED: 1-SET VK MEASURING WIRES 1-MEASURING INSTRUMENT

Complete information regarding the use of Gear Measuring Wires is contained in a 50-page section of the Van Keuren CATALOG and HANDBOOK No. 35. Included in this section are:

—table of wire sizes for the 1.92", 1.728", 1.68" and 1.44" series.

—tables of wire measurement including change factors for standard external and internal spur gears of 14½°, 17½°, 20°, 25°, and 30° pressure angles and of from 5 to 500 teeth.

—table of relationships between depth of cut and tooth thickness for common pressure angle gears.

—definitions and exact formulas covering involute spur gears.

—tables of involute tooth parts for standard addendum and stub tooth involute gears.

—information, formulas and examples regarding the wire measurement of helical gears.

—information and examples concerning the wire measurement of enlarged pinions and reduced gears.

—tables of wire measurement for involute splines.

—tables of wire measurement for involute serrations.

—tables of comparative measurement over three sizes of wires for use in involute profile checking.

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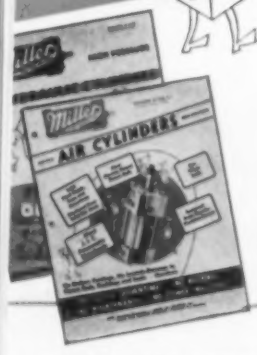

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Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

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in the popular sizes, mountings and prices listed below

Any of the interchangeable mountings illustrated can be easily attached to Basic Model 53 by tie rod nuts in a few moments by any customer. This gives you ...inal equipment and for convenient re-use with ...olify your "stock" and maintenance problems.

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... stock hydraulic cylinders for 2000-3000 ... operation. Piston Rods of "Stock" Cylinders ...re "Style No. 2 Standard."

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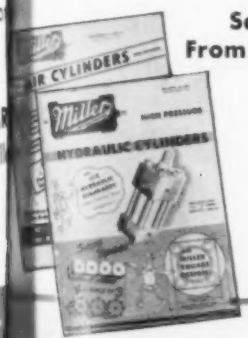

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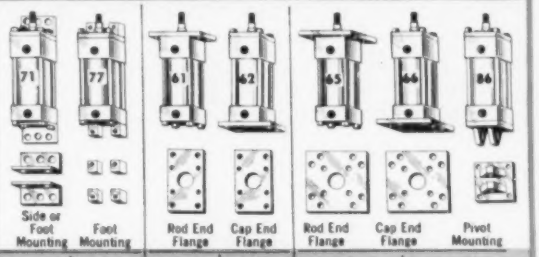
PRICES OF MOUNTING ATTACHMENTS ONLY



					AIR A77 A71	HYD. H77 H71	AIR A61 A62	HYD. H61 H62	AIR A86	HYD. H65 H66 H86
						$2.90		$8.20		$14.35
						2.90		8.20		14.35
						2.90		8.20		14.35
						2.90		8.20		14.35
						2.90		8.20		14.35
					$2.05		$4.60		$6.90	
					2.05		4.60		6.90	
					2.05		4.60		6.90	
					2.05		4.60		6.90	
					2.05		4.60		6.90	
					2.05	2.95	4.60	8.55	6.90	17.05
					2.05	2.95	4.60	8.55	6.90	17.05
					2.05	2.95	4.60	8.55	6.90	17.05
					2.05	2.95	4.60	8.55	6.90	17.05
					2.05	2.95	4.60	8.55	6.90	17.05
					2.25	2.95	4.80	9.00	7.55	19.80
					2.25	2.95	4.80	9.00	7.55	19.80
					2.25	2.95	4.80	9.00	7.55	19.80
					2.25	2.95	4.80	9.00	7.55	19.80
					2.25	2.95	4.80	9.00	7.55	19.80
					2.55	4.35	6.35	11.75	9.90	23.10
					2.55	4.35	6.35	11.75	9.90	23.10
					2.55	4.35	6.35	11.75	9.90	23.10
					2.55	4.35	6.35	11.75	9.90	23.10
					2.55	4.35	6.35	11.75	9.90	23.10
4"	2"	Non	56.25	106.00	2.85	5.15	6.70	12.90	11.05	26.80
4"	4"	Non	58.85	109.40	2.85	5.15	6.70	12.90	11.05	26.80
4"	6"	Non	61.45	112.80	2.85	5.15	6.70	12.90	11.05	26.80
4"	8"	Non	64.05	116.20	2.85	5.15	6.70	12.90	11.05	26.80
4"	11"	Non	67.95	121.30	2.85	5.15	6.70	12.90	11.05	26.80
5"	3"	Both	98.25		3.15		7.00		12.35	
5"	5"	Both	101.65		3.15		7.00		12.35	
5"	7"	Both	105.05		3.15		7.00		12.35	
5"	9"	Both	108.45		3.15		7.00		12.35	
5"	13"	Both	115.25		3.15		7.00		12.35	
6"	2"	Non	80.60		3.35		7.25		13.55	
6"	4"	Non	84.90		3.35		7.25		13.55	
6"	6"	Non	89.20		3.35		7.25		13.55	
6"	8"	Non	93.50		3.35		7.25		13.55	
6"	11"	Non	99.95		3.35		7.25		13.55	
8"	3"	Both	157.35		3.70		10.55		17.60	
8"	5"	Both	162.45		3.70		10.55		17.60	
8"	7"	Both	167.55		3.70		10.55		17.60	
8"	9"	Both	172.65		3.70		10.55		17.60	
8"	13"	Both	182.85		3.70		10.55		17.60	

Complete Miller "custom-built" line includes: air cylinders, 1½" to 20" bores, 200 psi operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 psi operation, 8" to 14" bores for 250 psi operation; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 psi operation. All mounting styles available. Also, a complete line of Fluid Pressure Boosters and Accumulators.

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Eliminate Breakage

BRASS BARRELS
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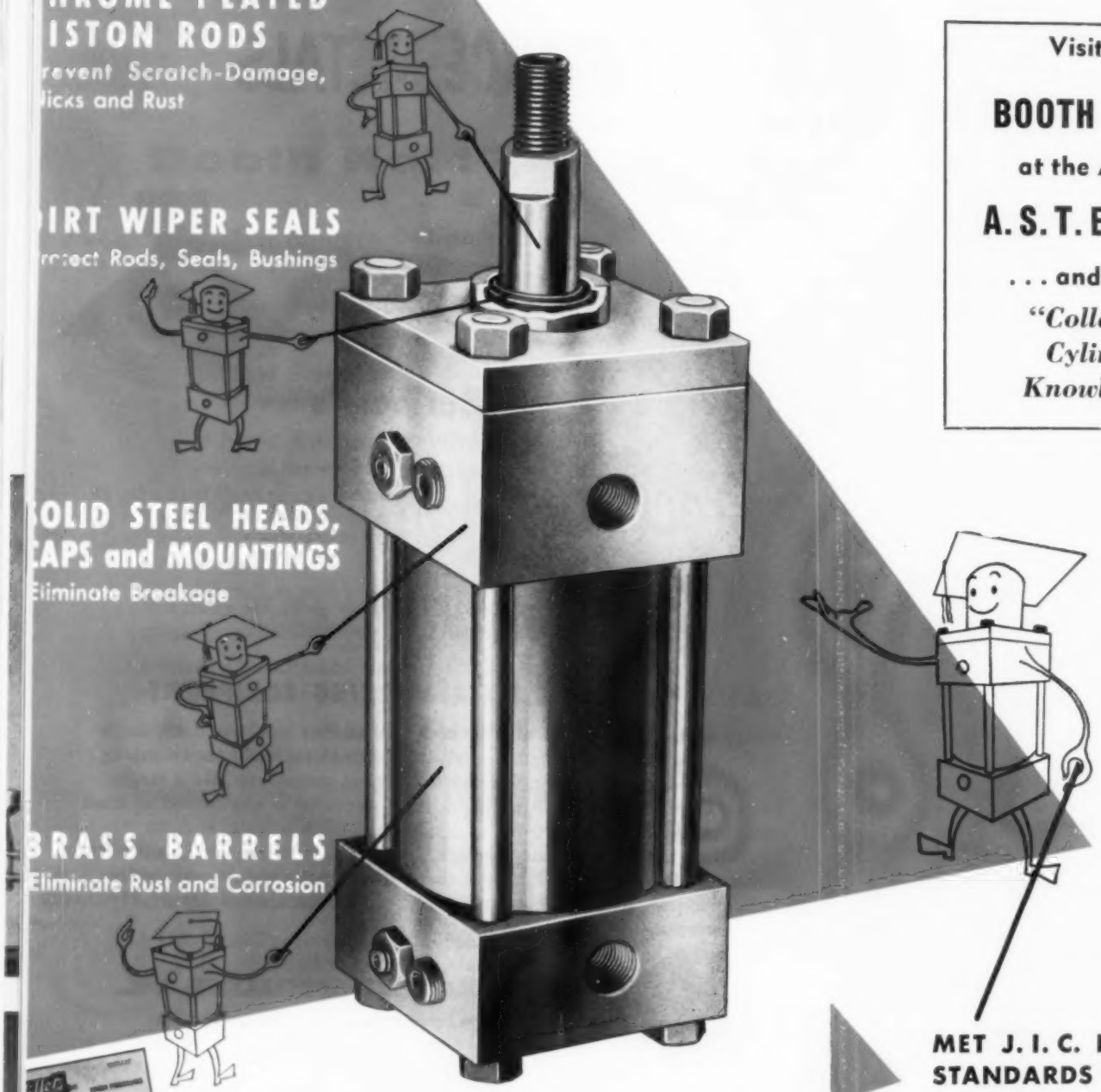

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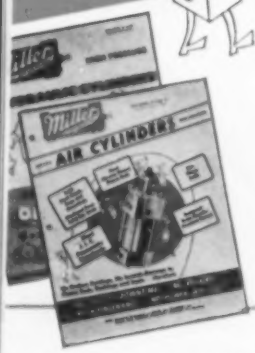

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Augmenting Miller's Quality-Famous Line of "Custom-Built" Cylinders...

Miller Stock AIR AND HYDRAULIC CYLINDERS

Available for *Immediate Delivery*..

in the popular sizes, mountings and prices listed below

Any of the interchangeable mountings illustrated can be easily attached to Basic Model 53 by tie rod nuts in a few moments by any customer. This gives you a wide selection of models for original equipment and for convenient re-use with other mounting attachments to simplify your "stock" and maintenance problems.

ORDER DIRECTLY FROM THIS LIST...

"Stock" Cylinders are shipped as Basic Model 53. Your selection of Mounting Attachments are shipped (unattached) with cylinders. Prices are F.O.B. our plant.

			BASIC CYLINDER PRICES ONLY		PRICES OF MOUNTING ATTACHMENTS ONLY					
			Basic Model 53 — Tie Rods Extended Rod End		71 Side or Foot Mounting	77 Foot Mounting	61 Rod End Flange	62 Cap End Flange	65 Rod End Flange	66 Cap End Flange	86 Pivot Mounting
Bore	Stroke	Cushion	AIR A53	HYD. H53	AIR A77 A71	HYD. H77 H71	AIR A61 A62	HYD. H61 H62	AIR A86	HYD. H65 H66 H86
1½"	2"	Non		$58.50		$2.90		$8.20		$14.35
1½"	4"	Non		60.70		2.90		8.20		14.35
1½"	6"	Non		62.90		2.90		8.20		14.35
1½"	8"	Non		65.10		2.90		8.20		14.35
1½"	11"	Non		68.40		2.90		8.20		14.35
2"	2"	Non	$37.70		$2.05		$4.60		$6.90	
2"	4"	Non	39.40		2.05		4.60		6.90	
2"	6"	Non	41.10		2.05		4.60		6.90	
2"	8"	Non	42.80		2.05		4.60		6.90	
2"	11"	Non	45.35		2.05		4.60		6.90	
2"	3"	Both	62.05	94.50	2.05	2.95	4.60	8.55	6.90	17.05
2"	5"	Both	63.75	97.00	2.05	2.95	4.60	8.55	6.90	17.05
2"	7"	Both	65.45	99.50	2.05	2.95	4.60	8.55	6.90	17.05
2"	9"	Both	67.15	102.00	2.05	2.95	4.60	8.55	6.90	17.05
2"	13"	Both	70.55	107.00	2.05	2.95	4.60	8.55	6.90	17.05
2½"	2"	Non	41.45	73.30	2.25	2.95	4.80	9.00	7.55	19.80
2½"	4"	Non	43.35	76.00	2.25	2.95	4.80	9.00	7.55	19.80
2½"	6"	Non	45.25	78.70	2.25	2.95	4.80	9.00	7.55	19.80
2½"	8"	Non	47.15	81.40	2.25	2.95	4.80	9.00	7.55	19.80
2½"	11"	Non	50.00	85.45	2.25	2.95	4.80	9.00	7.55	19.80
3¼"	3"	Both	77.80	126.85	2.55	4.35	6.35	11.75	9.90	23.10
3¼"	5"	Both	79.80	129.85	2.55	4.35	6.35	11.75	9.90	23.10
3¼"	7"	Both	81.80	132.85	2.55	4.35	6.35	11.75	9.90	23.10
3¼"	9"	Both	83.80	135.85	2.55	4.35	6.35	11.75	9.90	23.10
3¼"	13"	Both	87.80	141.85	2.55	4.35	6.35	11.75	9.90	23.10
4"	2"	Non	56.25	106.00	2.85	5.15	6.70	12.90	11.05	26.80
4"	4"	Non	58.85	109.40	2.85	5.15	6.70	12.90	11.05	26.80
4"	6"	Non	61.45	112.80	2.85	5.15	6.70	12.90	11.05	26.80
4"	8"	Non	64.05	116.20	2.85	5.15	6.70	12.90	11.05	26.80
4"	11"	Non	67.95	121.30	2.85	5.15	6.70	12.90	11.05	26.80
5"	3"	Both	98.25		3.15		7.00		12.35	
5"	5"	Both	101.65		3.15		7.00		12.35	
5"	7"	Both	105.05		3.15		7.00		12.35	
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6"	2"	Non	80.60		3.35		7.25		13.55	
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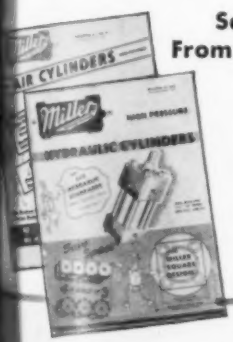
Miller "Stock" Cylinders fully meet the J.I.C. standards and are identical to Miller "Custom-Built" Cylinders in design and construction.

"Stock" Air Cylinders are for 200 psi operation, "stock" hydraulic cylinders for 2000-3000 psi operation. Piston Rods of "Stock" Cylinders are "Style No. 2 Standard."

For complete descriptive and dimensional data on both "Stock" and "Custom-Built" Miller Cylinders, write for Bulletins A-105 and H-104 sent FREE on request.



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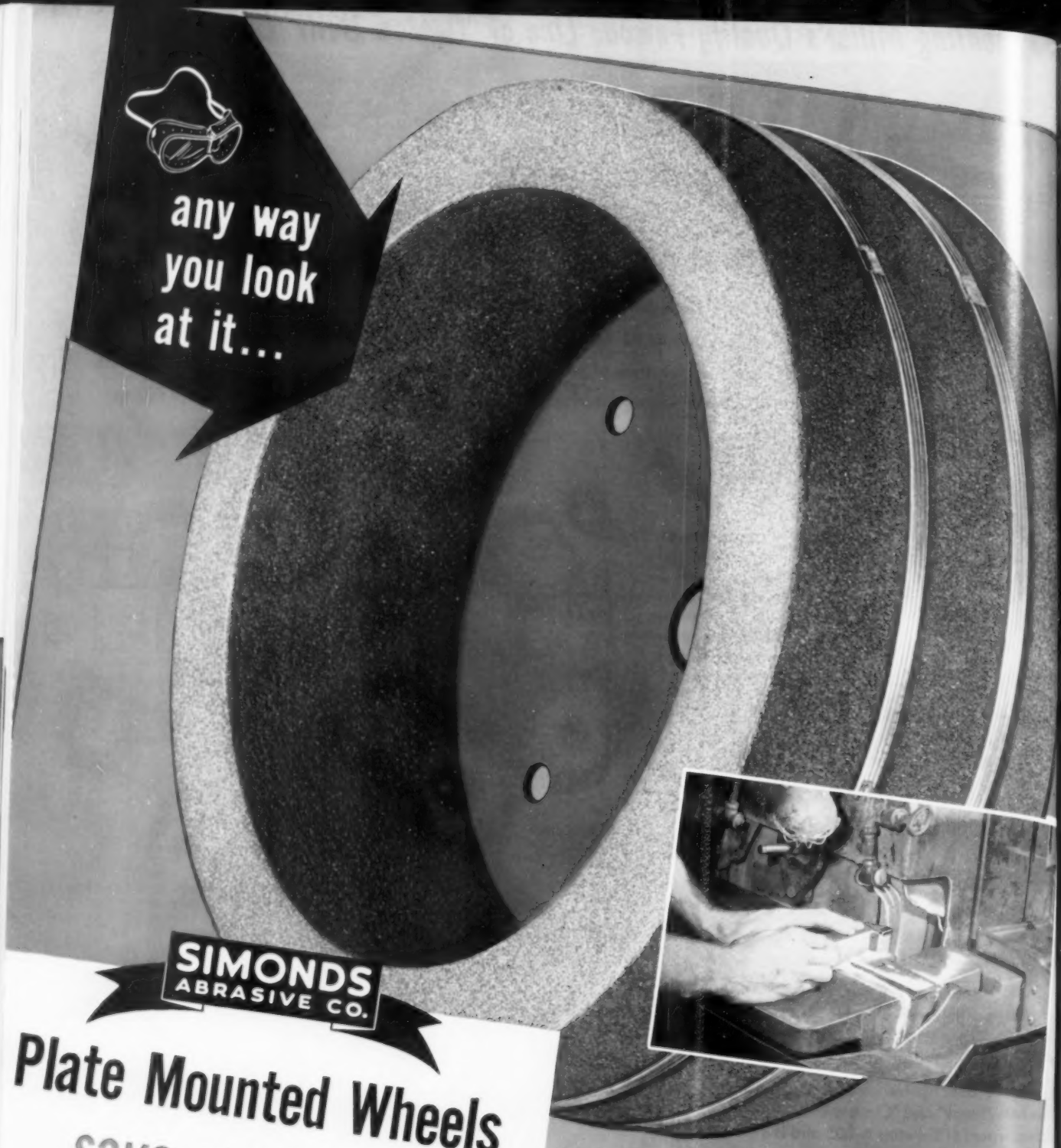

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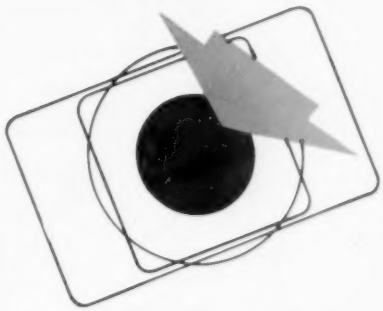
O-M CYLINDERS

air • hydraulic

fit where others won't!



O-M Cylinders require up to ⅓ LESS INSTALLATION SPACE than conventional cylinders of the same bore, because O-M's *Special Interlocking Mechanism* eliminates projecting tie rods and bulky end caps. In addition, the "O. D." of O-M Cylinders can be easily and accurately machined for cartridge mounting within your equipment.

O-M Special Interlocking Mechanism also assures perfect alignment giving O-M the lowest coefficient of friction of any cylinder. Thus, O-M Cylinders are smoother operating at low or high speeds regardless of length of stroke. Easily removed, inspected, repaired, replaced. Completely interchangeable parts.

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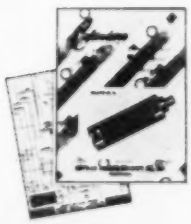
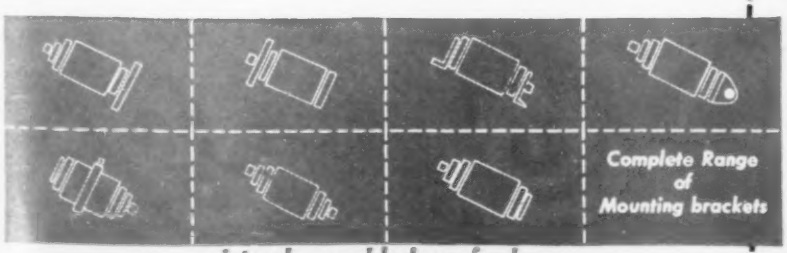


Write today for FREE catalog and complete set of ½- and ¼-scale templates showing all cylinders and mounting brackets.

mail coupon now!



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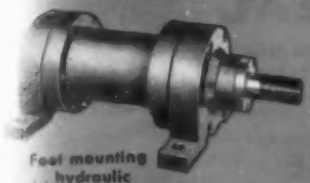


Foot mounting . . hydraulic

Pendulum mounting . . hydraulic

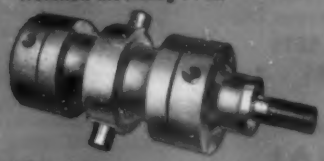
Rabbet mounting . . hydraulic

Base mounting . . air

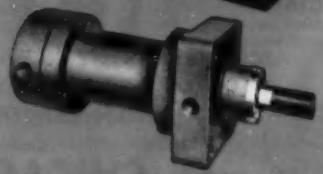
Trunnion mounting . . air

Flange mounting . . air

Base mounting . . hydraulic



Trunnion mounting . . hydraulic



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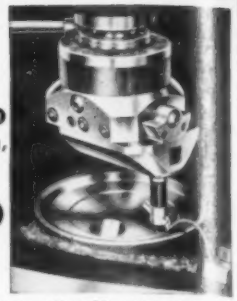

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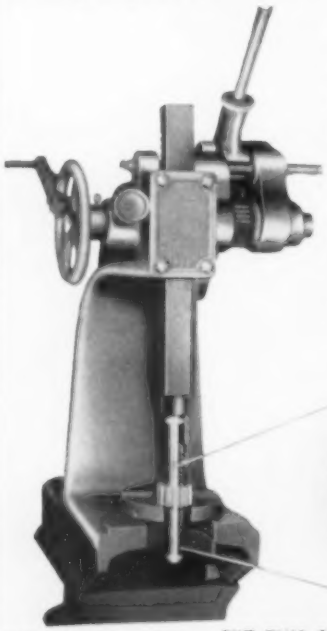

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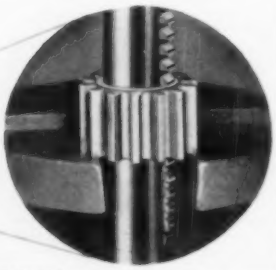

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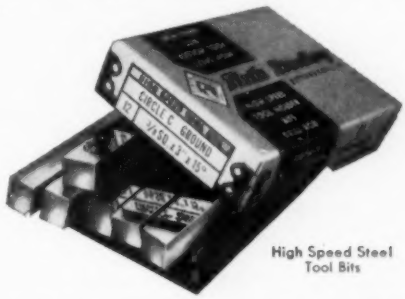
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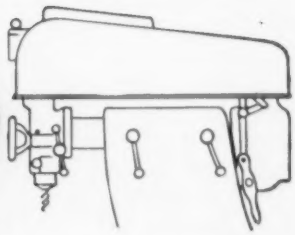

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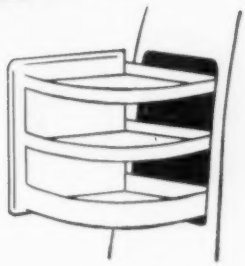

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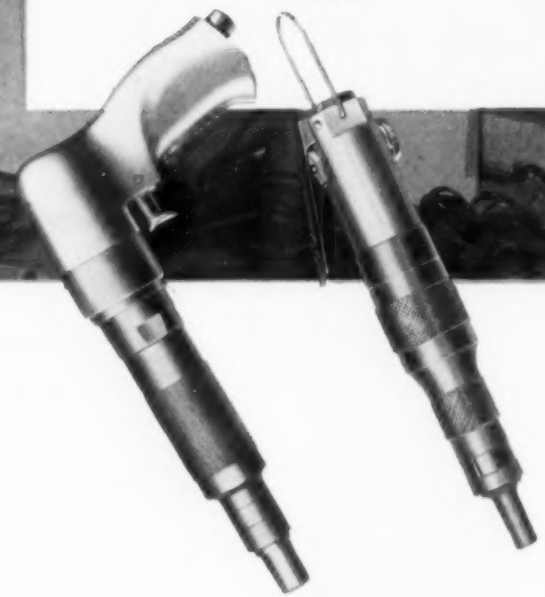

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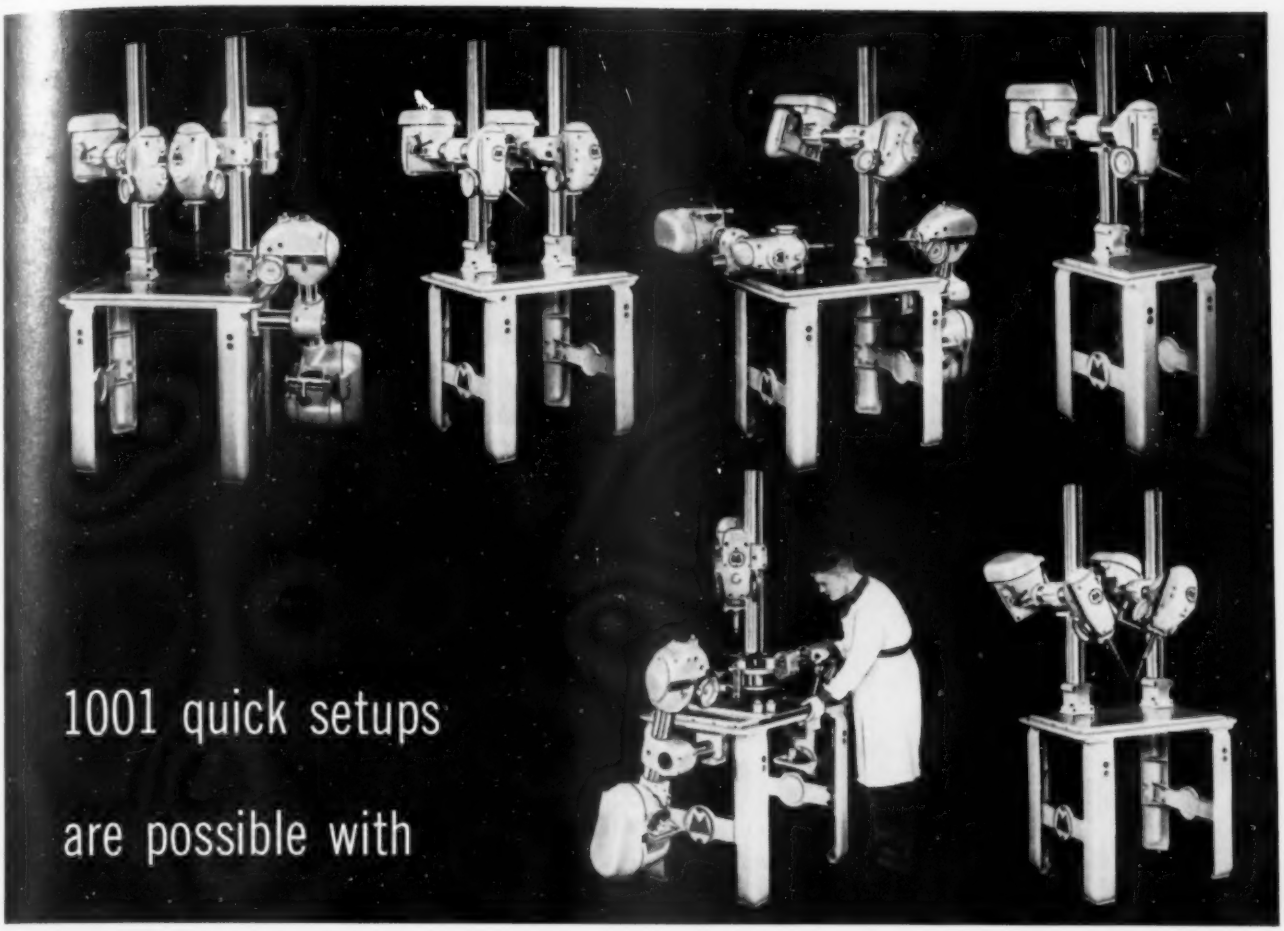

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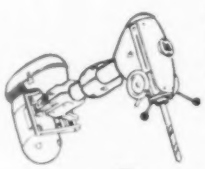

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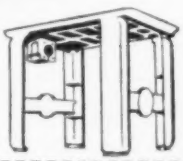

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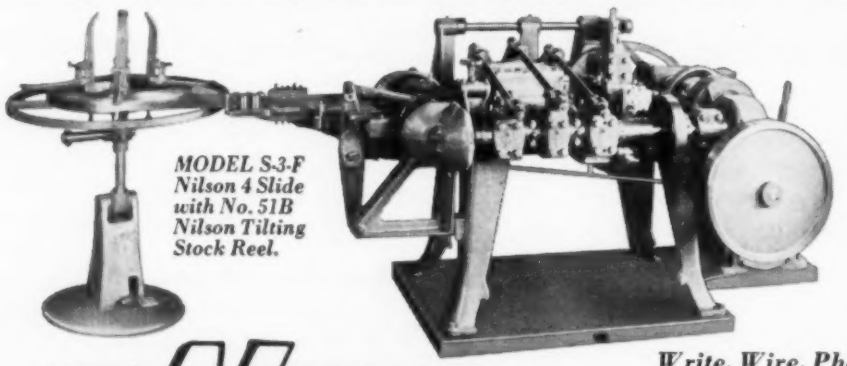

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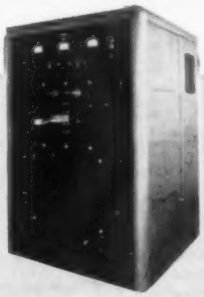

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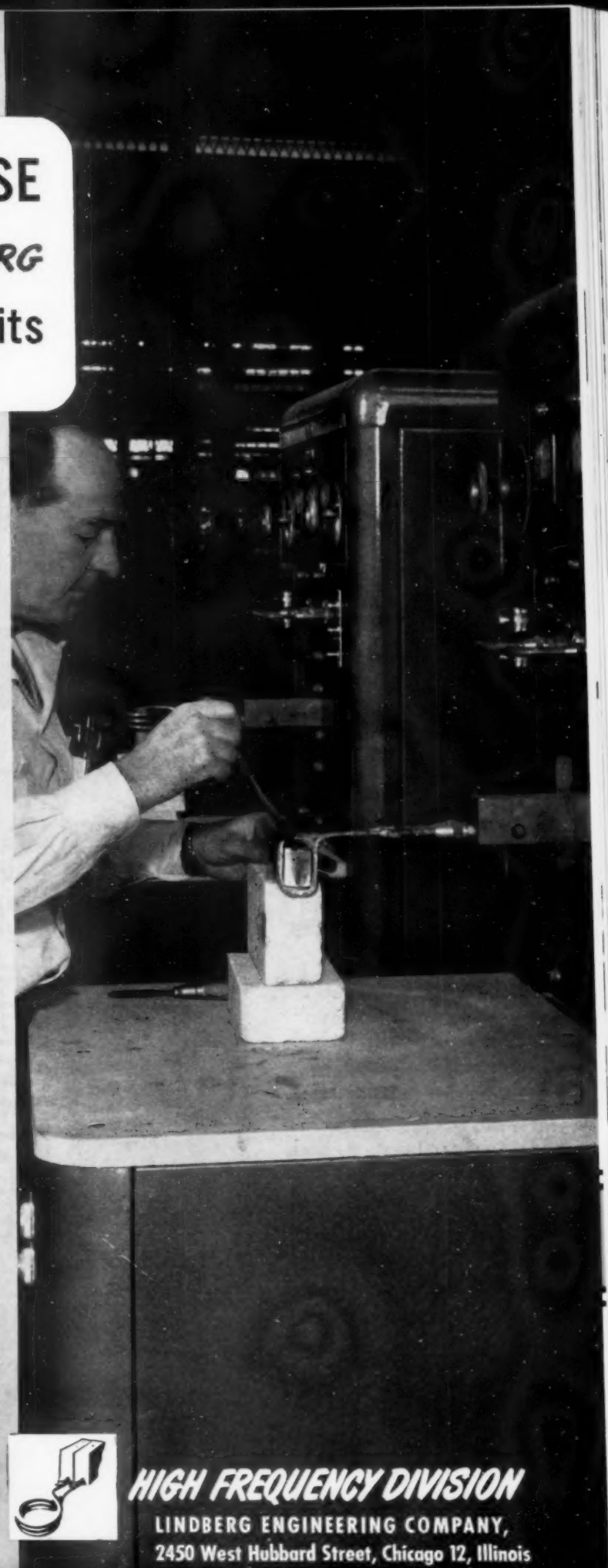

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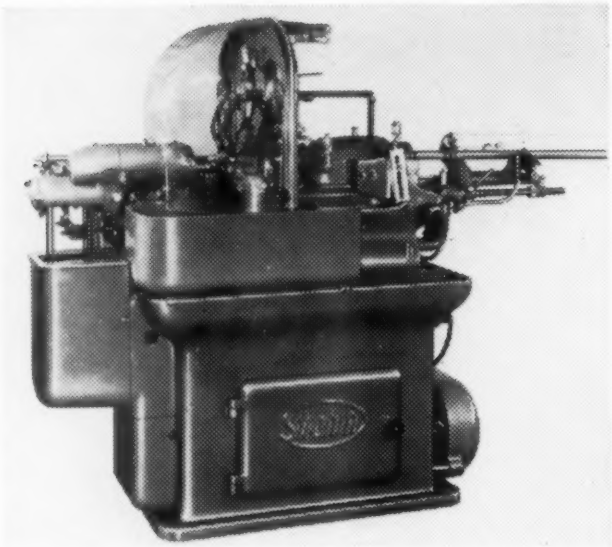

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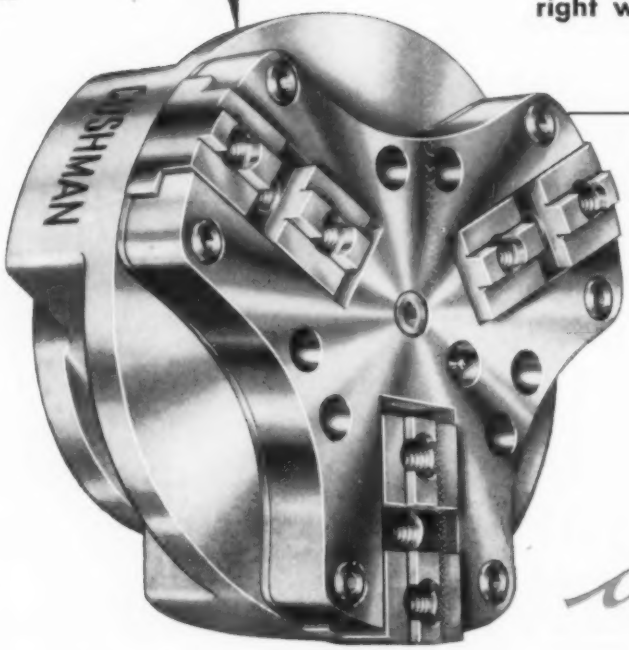

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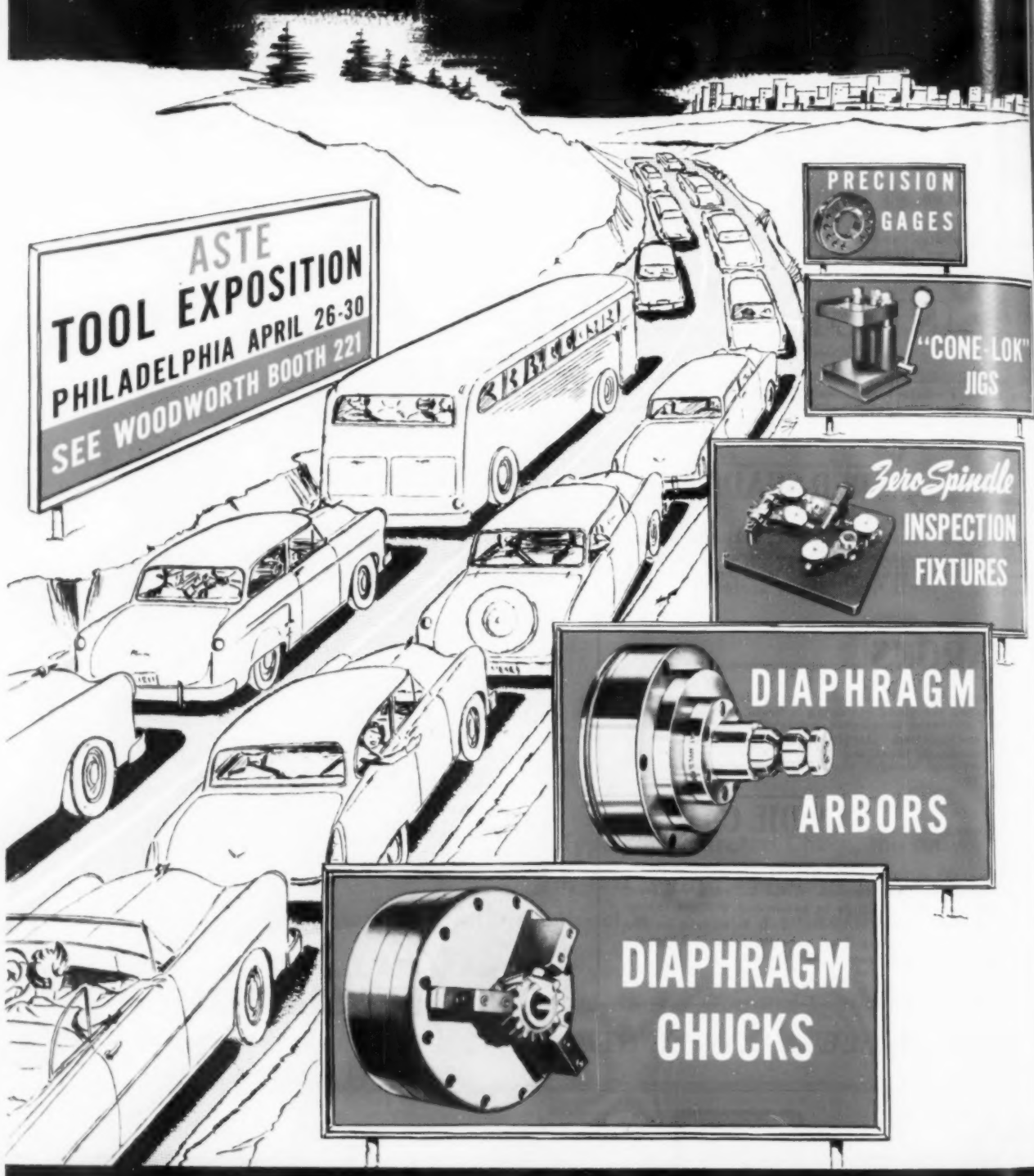

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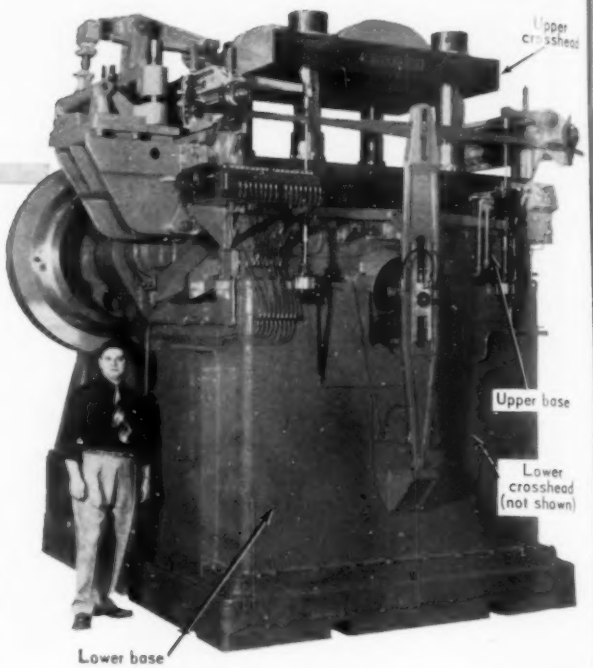

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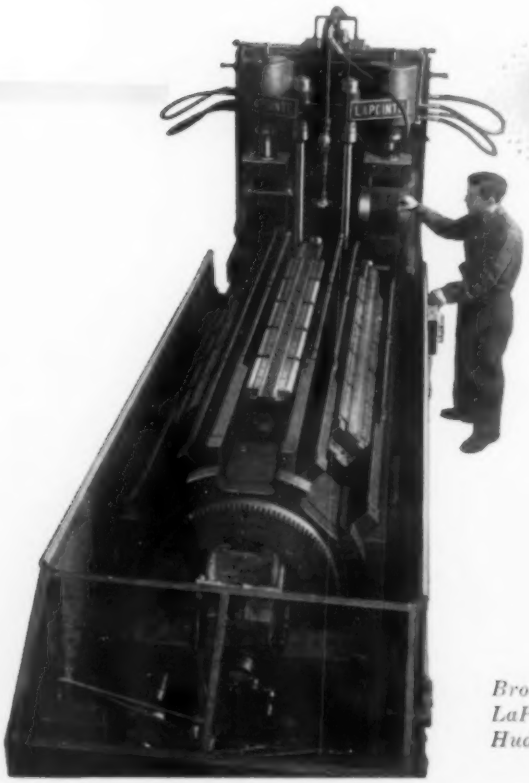

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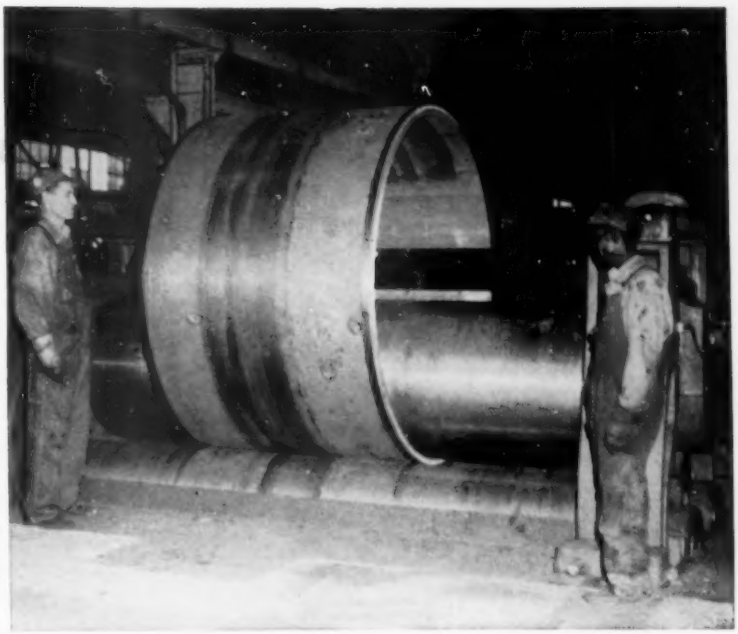

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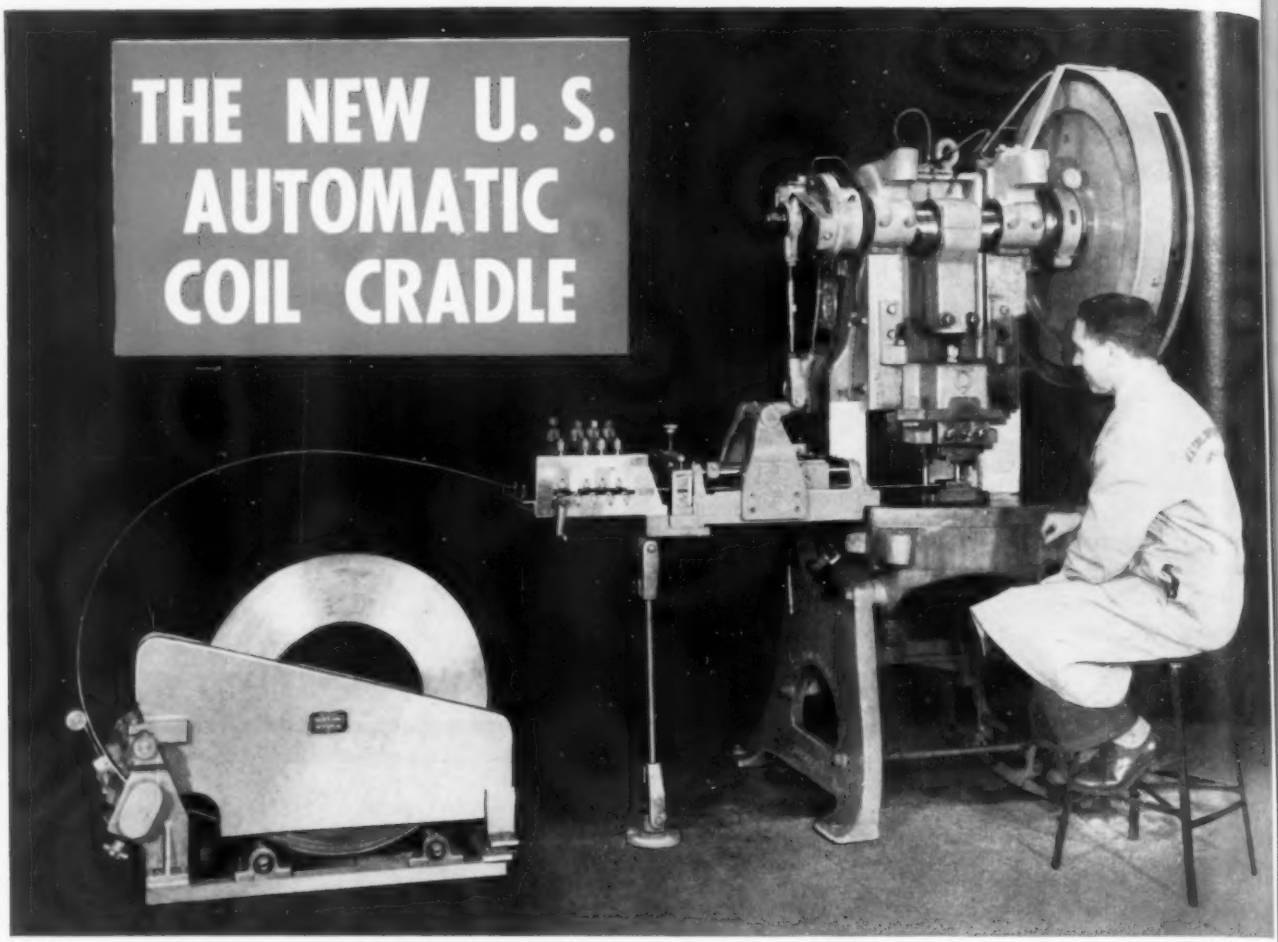

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U. S. Power Driven Straighteners

U. S. Scrap Chopper

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Index of The Tool Engineer Advertisers, April, 1954

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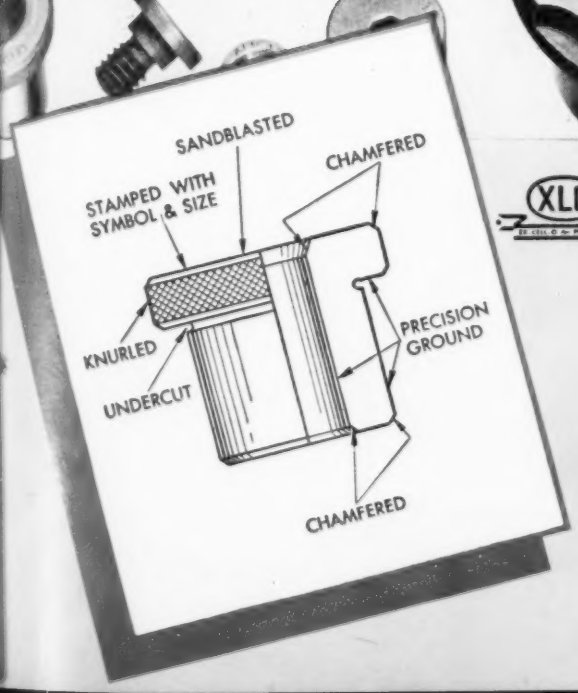

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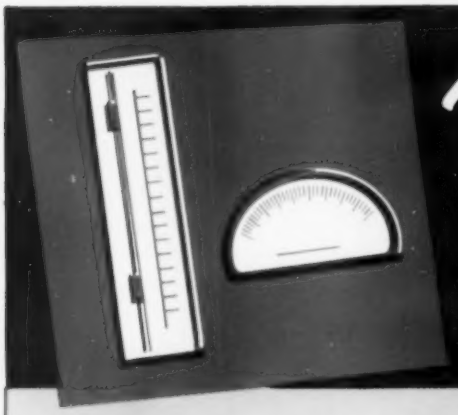

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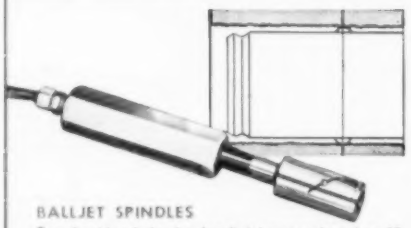

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For checking holes having finishes rougher than 65 micro-inches, for porous parts, narrow lands or checking to the very end of a hole. Setting is made with gage blocks and a Standard Calibrator. NO MASTER SETTING RINGS REQUIRED—not even one.

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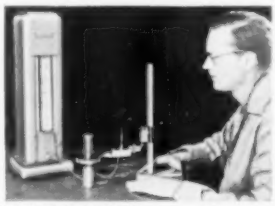

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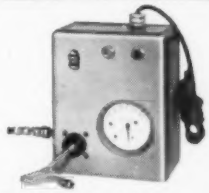

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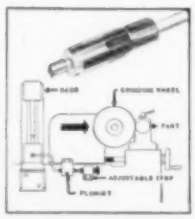

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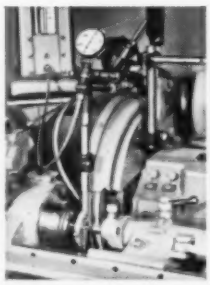

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